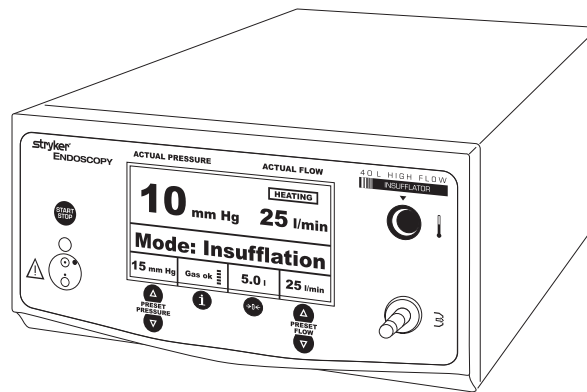


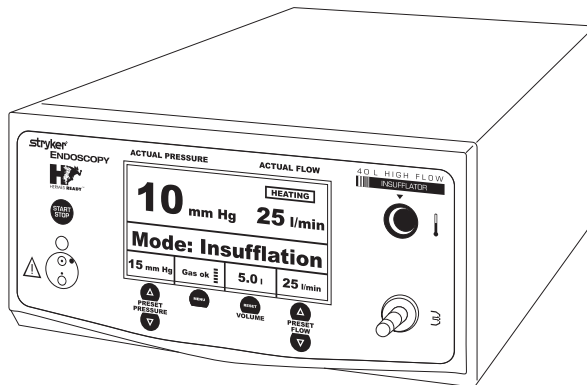
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ENDOSCOPY

40L HIGH FLOW INSUFFLATOR



Standard Model



Hermes Ready Model

SERVICE MANUAL

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Liability

Device and additional equipment have been carefully and thoroughly tested at the factory before shipping. The manufacturer is only responsible for the safety and reliability as well as performance of the product if all tests and repairs are carried out by qualified and authorized personnel and the device and all additional equipment is employed according to its proper and intended use.



WARNING

Maintenance, repair, or modifications may be carried out only by personnel authorized by the manufacturer. The electrical installation of the power supply has to comply with DIN/IEC rules and regulations.

An authorized service technician has to inspect and service the device every two years to ensure the safety and functionality of the unit. If the service interval is not adhered to, the manufacturer does not assume any liability for the functional safety of the device.

Service technicians are to be trained and certified only by the manufacturer.

The manufacturer is not liable for direct or consequential damages; the warranty is null and void if

- the device or any additional equipment is used improperly..
- instructions and rules of the manual are not observed.
- the device or any additional equipment is used, prepared, or maintained/repared improperly.
- non-authorized personnel carries out repairs, adjustments, or modifications on the device or any additional equipment.
- the prescribed inspection and maintenance intervals are exceeded.

Receiving technical documents does not constitute authorization to repair, adjust, or modify the device or any additional equipment.

Proper care and maintenance of the device and any additional equipment is required to ensure safe operation. Function and operational of the device and additional equipment thus have to be checked after each maintenance session to protect patient and operator. New factory supplied and repaired products have to be prepared before first use (see manual).

Protection from Germs

Devices, instruments, and any additional equipment returned for repairs have to be prepared before shipping according to the manual to protect the service personnel and ensure safety during transport. If this is not possible,

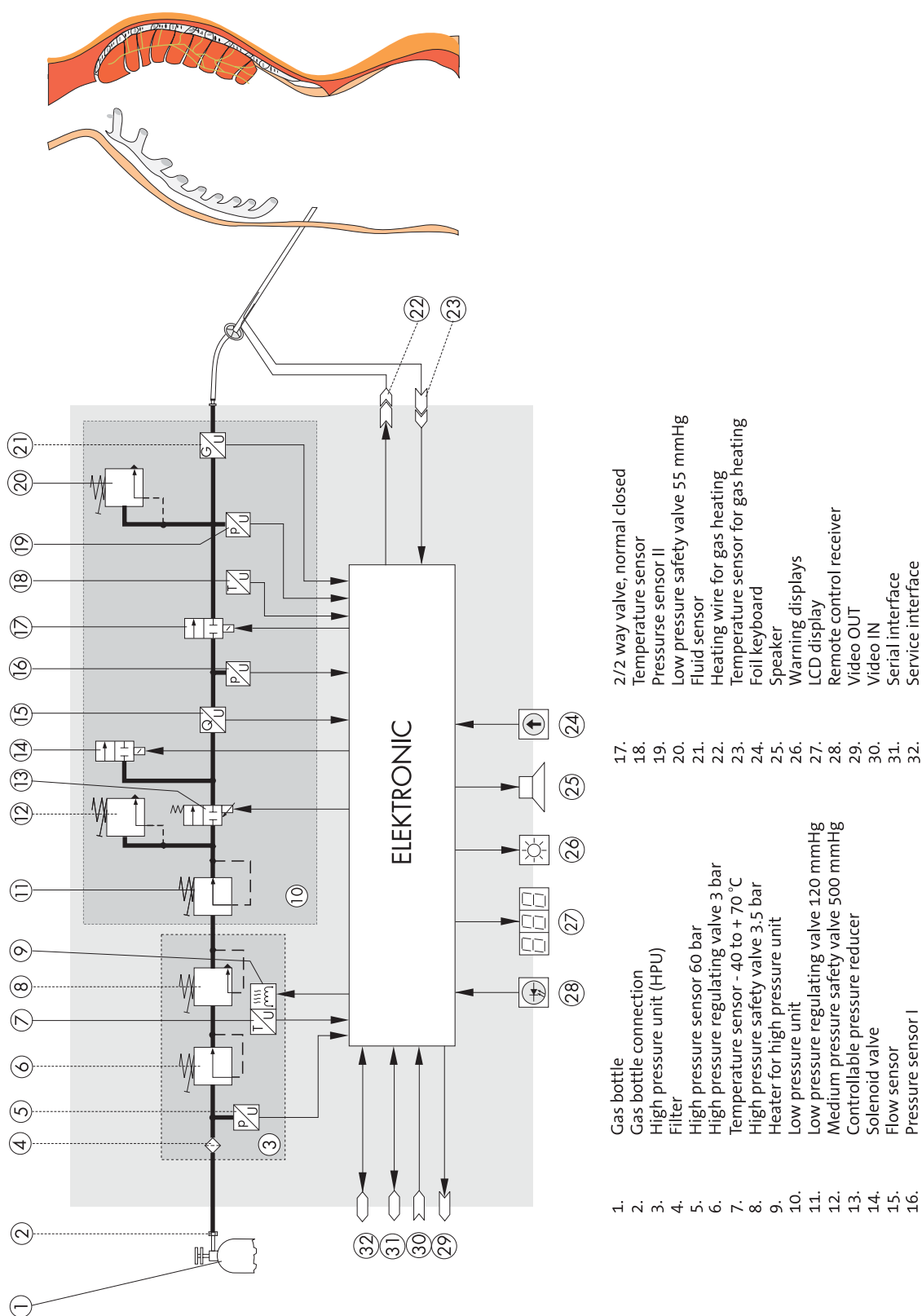
- the contaminated product has to be clearly marked referencing the type of contamination and
- has to be shrink-wrapped in two layers of safety foil.

Certificate

The device or instrument operator has to be provided with a certificate about the scope and extent of the performed services/repairs. This certificate has to list the date of the service as well as the company together with a signature. Please use the maintenance and checklist included in the back of the service manual.

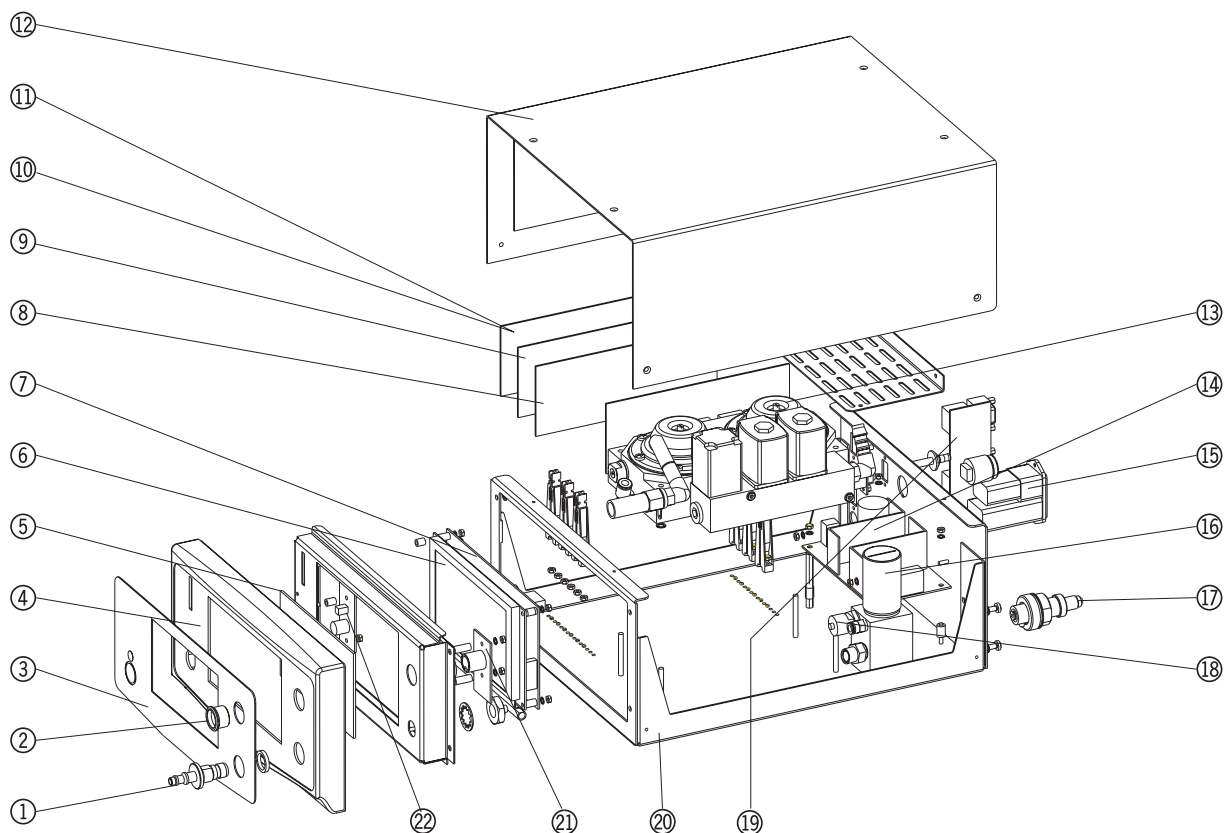
1 Introduction/Basics

1-1 Functional Diagram F105



1 Introduction/Basics

1-2 Explosion Diagram

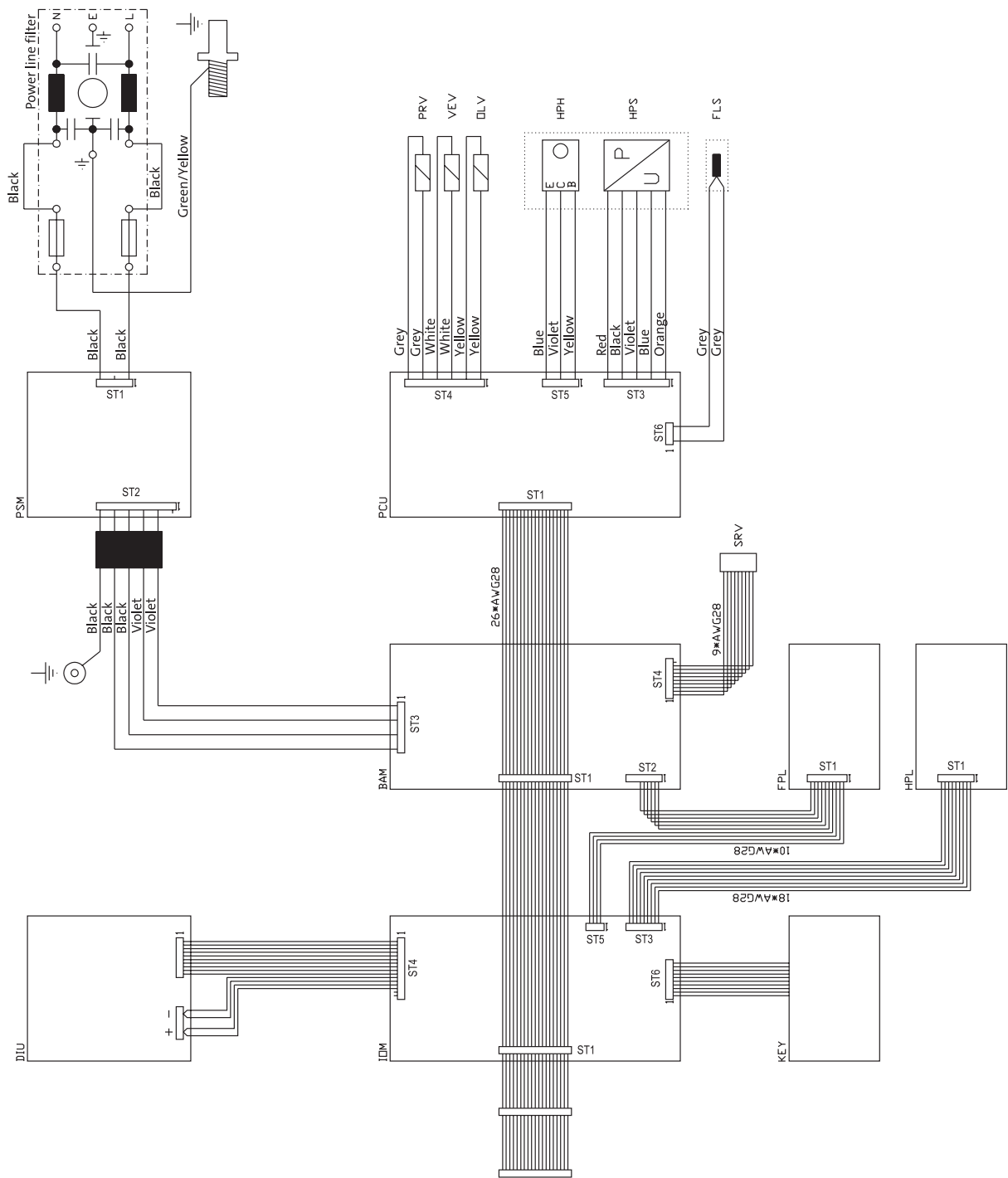


1. Insufflation tube connection
2. Gas heater connection
3. Front plate / Design foil
4. Front plate
5. Cloth sealing strip
6. LCD display
7. Graphic board
8. Basic module BAM 01
9. I/O module IOM 01
10. Video module VIM 01 (alternate option)
11. Interface-Modul IFM 01(alternate option)

12. Upper section of case
13. Low pressure unit LPU 01
14. Power plug
15. Non-heating plug with safety catch
16. High pressure unit HPU 01
17. Gas connection Co2
18. High pressure safety valve
19. Video In/Out board
20. Bottom of case
21. Heater board HPL
22. Front board FPL

1 Introduction/Basics

1-3 Cable Layout Plan



1 Introduction/Basics

This device has to be serviced every two years. The chapter **Function Test** describes this routine inspection.

Please use the maintenance and checklist included in the back of the service manual to document the bi-annual inspection.

1-4 Testing Tools and Resources

The following tools and resources are required to perform the maintenance and service tasks described in this manual. Please make sure that all tools and resources are calibrated and in perfect working order before commencing any service or maintenance tasks.

- Manometer Range 0-70 mm Hg, Test Class 1.0
- Manometer Range 0-7 bar, Test Class 1.6
- Manometer Range 0-100 bar, Test Class 1.6
- Silicone Tube 8x2 mm
- PVC Tube 6x4 mm, 1 m
- T Connector 8-8-8 mm
- Flow Column Range 0-20 l/min CO₂
Max. Pressure Drop at 9 l/min < 10 mbar
- Flow Column Range 0-40 l/min CO₂
Max. Pressure Drop at 9 l/min < 10 mbar
- Veress Hollow Needle Length 100 mm, Opening Diameter 1.4 mm, Inner Diameter 1.6 mm
- Heater Calibration Box T100/T101
- Universal Multimeter

1 Introduction/Basics

1-5 Front of the Device

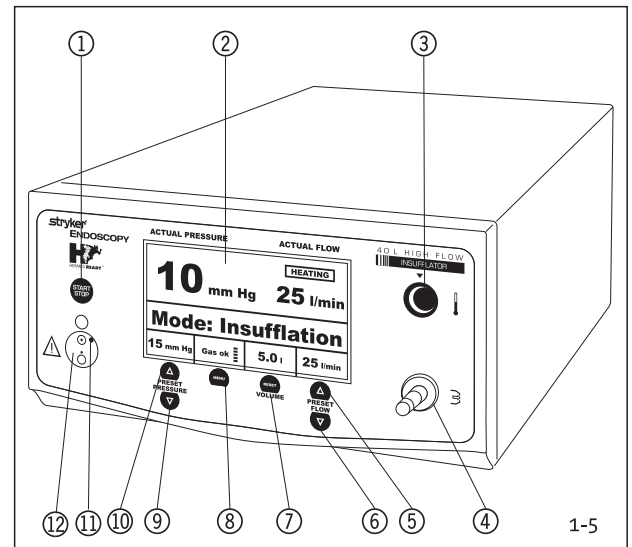


Fig. 1-5: : F105 Front Control and Display Elements

- ① Start/Stop Key
- ② Display
- ③ Gas Heater Connection
- ④ Insufflation Tube Connection
- ⑤ Nominal Gas Flow +
- ⑥ Nominal Gas Flow -
- ⑦ Gas Consumption Reset Key
- ⑧ Menu Key
- ⑨ Nominal Pressure -
- ⑩ Nominal Pressure +
- ⑪ Line Voltage LED
- ⑫ ON/OFF Key

1-6 Rear of the Device

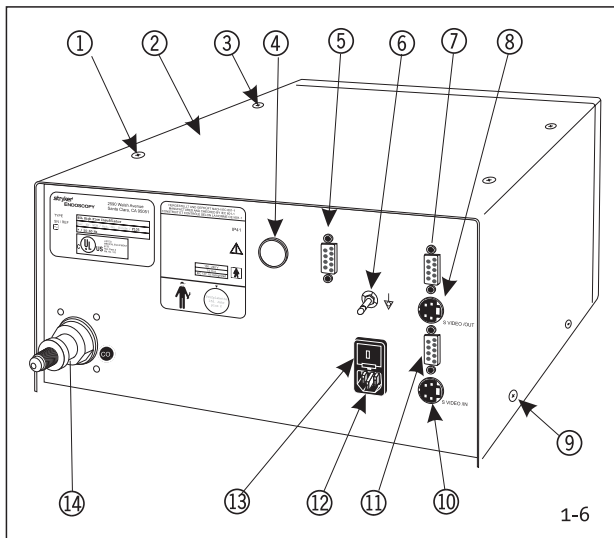


Fig. 1-6: Connection Elements, Rear of the Device

- ① Recessed Head Screw to Fasten Case
- ② Case Cover
- ③ Recessed Head Screw to Fasten Case
- ④ Blank Cover HERMES (Optional)
- ⑤ Service Interface
- ⑥ Potential Equalization Plug
- ⑦ Video Output RGB/FBAS
- ⑧ Video Output SVHS
- ⑨ Recessed Head Screw to Fasten Case
- ⑩ Video Input SVHS
- ⑪ Video Input RGB/FBAS
- ⑫ Power Pack Plug
- ⑬ Fuse Holder
- ⑭ Gas Connection

1-7 Opening the Device

1. You will need a recessed head screwdriver (Phillips) size 2 to open the device.
2. (See Fig. 1-6)
Remove four screws from top ① and two screws from each side ⑨.
3. Lift the case cover panel ② towards the top and remove.

2 Function Test

2-1 Safety Test

Trained personnel has to perform a safety test as part of the annual system inspection.

1. Perform a visual inspection. Make sure that
 - the fuse corresponds with the specifications indicated by the manufacturer
 - labels and stickers on device are legible
 - the mechanical condition of the unit allows for safe operation
 - the device is clean
2. Measure leakage currents according to DIN EN 60601-1/ IEC 601-1.
3. Measure protective conductor resistance according to DIN EN 60601-1/IEC 601-1. The protective conductor resistance is measured while device is connected to the power supply. The maximum value is 0.2 Ω .
4. Measure the insulation resistance with 500-700 V DC. The min. value is 50 M Ω . The electric strength with high voltage cannot be measured.

As an alternative, perform safety test according to DIN VDE 0751 Section 1.

2-2 Damages Caused by Disinfectants, UV Rays, etc.

The surfaces of the device components can be changed and/or damaged by disinfectants used in the operating room or the ozone released during the use of UV emitters. This requires the following inspections:

Cabling

The cables are to be checked for proper fit and condition. Any cables suspected of being damaged or flawed in any way (e.g., insufficient insulation, breaks, malfunctioning contacts, etc.) are to be replaced.

Electronic Boards

If the boards show signs of corrosion or other damage to the contacts or soldering joints, they are to be replaced to ensure the safety of the device/system.

Front Panel and Case

Front panel and case are to be checked for damage. Check for safety-and function-relevant damages. The proper function of the control panel and displays is to be checked.

Tubing

Fluid can enter the device via the insufflation tube connection. This is detectable through the residue visible in the transparent tube in the area of the tube nozzle. If this is the case, please replace the entire pneumatics block.

2-3 Testing the High Pressure Unit (HPU)

The high-pressure unit consists of the following:

- Gas Intake Filter GIF
- High Pressure Sensor HPS
- High Pressure Controller HPC
- High Pressure Heater HPH
- High Pressure Valve HPV

2 Function Test

Testing High Pressure Unit for Leaks

1. Connect manometer (0-70 bar) to gas bottle connection.
2. Remove tube (press plastic ring and pull out tube) from HPU ② output and connect a 0-7 bar manometer.
3. Connect gas supply.
4. Briefly open and then reclose the gas supply.
5. Wait 10 min. Pressure at 70-bar manometer may not have dropped more than 5 bar.

Adjustment

- Check gas connection
- Replace high-pressure unit HPU

High Pressure Valve HPV

1. Open the gas supply line.
2. Use a felt marker to mark the position of the adjustment screw ① of the high-pressure controller (Fig. 2-3-1).

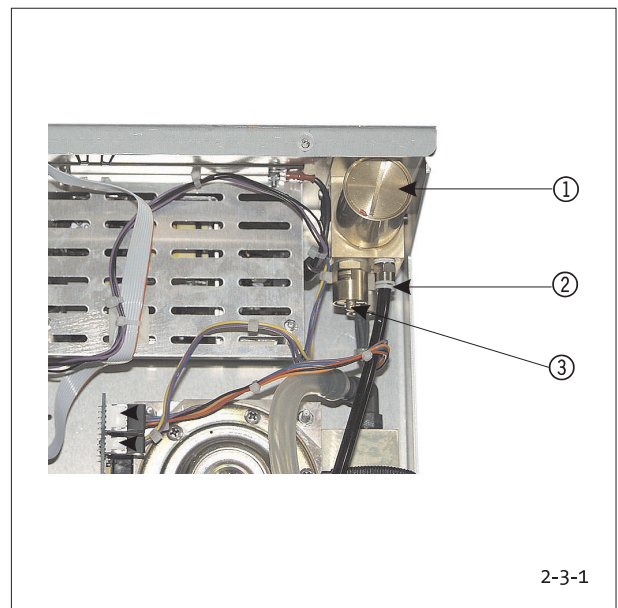


Fig. 2-3-1: Position of High Pressure Unit HPU

3. Turn adjustment screw ① at high-pressure controller to increase pressure until triggering of the high-pressure valve ③ can be clearly heard (hissing sound).
4. Reverse screw ① until you can no longer hear any hissing sound. The then reached pressure has to be above 4 bar.
5. Reset the adjustment screw to the marked position.

Adjustment

- Use the adjustment screw ③ of the high-pressure valve for any adjustments.

High Pressure Regulator HPR



NOTE
The output value drops with rising temperature (e.g., long operating hours).

1. Relieve pressure of tube at magnetic valve (briefly remove and reconnect tube) until a stable final value of 3.2 bar is reached (± 0.6).
2. Remove manometer and reconnect tube.

2 Function Test

Adjustment

- Use the adjustment screw ① of the high-pressure controller for any adjustments.

2-4 Testing the Low Pressure Regulator LPR

1. Open the gas supply line.
2. In the service menu, open the “LPR Adjust” menu option and check the settings. (Adjust with adjustment screw, Fig. 2-4-1)

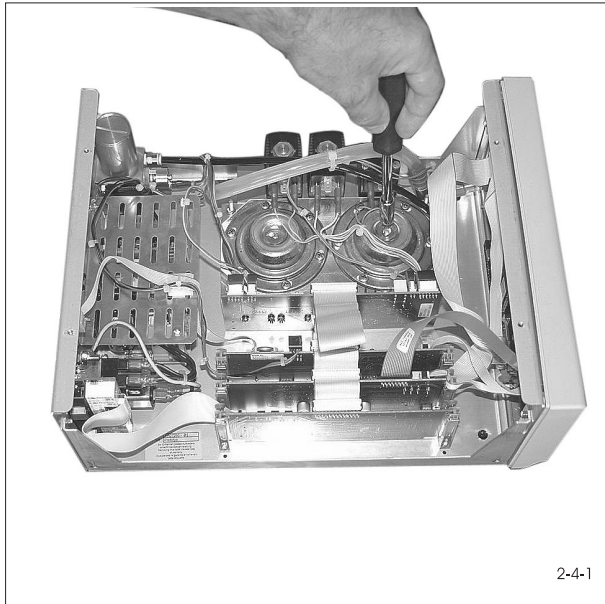


Fig. 2-4-1: F105 Low Pressure Controller Settings

2-5 Low Pressure Safety Valve LSV

Close device exit using a tube clamp (Fig. 2-6-1, ④).

In the service menu, open the “LSV Adjust” menu option and check the settings.

Adjustment

Use the adjustment screw of the low-pressure safety valve for a slight adjustments.

2-6 Testing Low Pressure Unit for Leaks

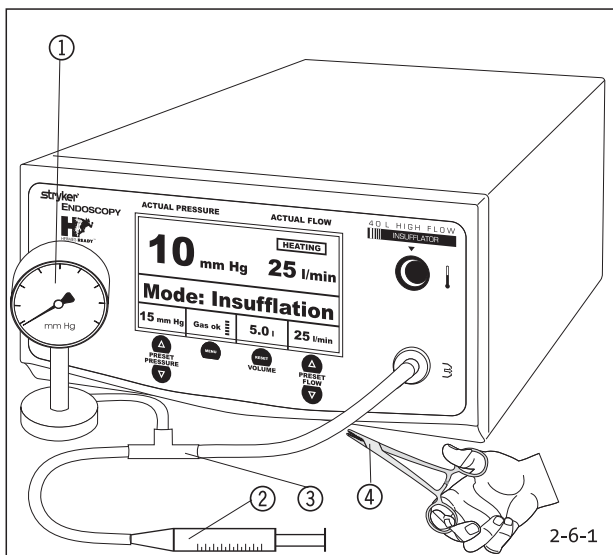


Fig. 2-6-1: Test Layout: Low Pressure Unit Leakage Test

- ① Manometer (0-70 mm Hg)

2 Function Test

- ② Syringe

- ③ T-Connector

1. Attach manometer ①, air-filled syringe ②, tube, and T-connector ③ to the insufflation tube connection.
2. Use the syringe to generate a pressure of at least 50 mm Hg. Clamp tube at 50 mm Hg.
3. Wait 30 seconds. Pressure at manometer may not have dropped more than max. 2 mm Hg.

Adjustment

- Check fluid sensor and low-pressure unit tube (and replace if necessary).

2-7 Testing Flow Volume

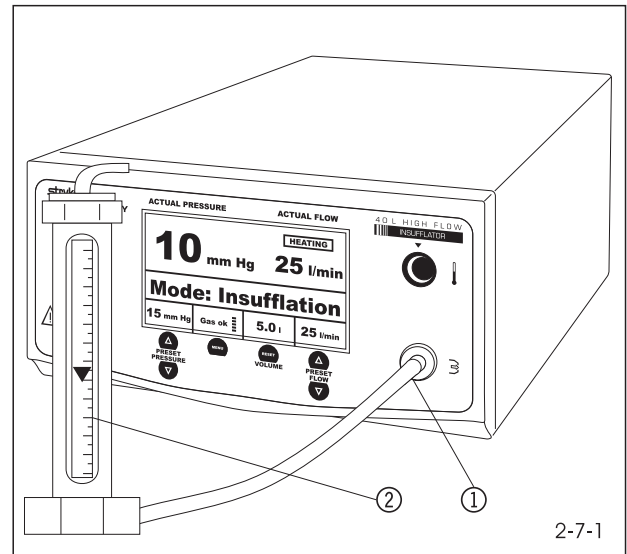


Fig. 2-7-1: Test Layout: Flow Volume

- ① Tube Connection
- ② Flow Column (40 l/min)

1. Attach a tube and a flow column to insufflation tube connection (Fig. 2-6-1).
2. Turn on device.
3. Set a nominal pressure of 15 mm Hg.
4. Press the Start/Stop key.
5. Check flow volume of device in gas flow levels 2 and 3. The value of the nominal flow indicator may not exceed a tolerance of $\pm 2,0$ l/min.
The flow column value is not to be considered until after gas flow fluctuations have stabilized.
6. Press the Start/Stop key to end test.
7. Remove all measuring tools and resources.

Adjustment

- Service menu option “Flow Calibration.”

2 Function Test

2-8 Testing Overpressure Alarm

1. Attach a tube and an air-filled syringe to insufflation tube connection (Fig. 2-5-1).
2. Use the syringe to slowly generate a pressure of 15 mm Hg.
3. Slowly increase pressure to 21 mm Hg and press the Start/Stop key.
4. An alarm is sounded after approx. 5 seconds and "Overpressure" is displayed.
5. Select gas flow level 2.
6. The bleeder (relief) system is activated after approx. 5 seconds (time and pressure value can be changed in the user menu).
7. The bleeder system relieves the pressure; alarm and "Overpressure" warning symbol are turned off.
8. Press the Start/Stop key and remove test tools and resources.

Adjustment

- Replace low-pressure unit.

2-9 Testing Blockage Alarm

1. Connect insufflation tube and close off the end of the tube.
2. Press the Start/Stop key.
3. An alarm is sounded after approx. 5 seconds and "Blockage" is displayed. The acoustic warning signal can be deactivated in the user menu.
4. Open the insufflation tube connection; the alarm is turned off.
5. Press the Start/Stop key.

Adjustment

- Return device to factory.

2-10 Testing Gas Heater

1. Connect a heater tube to insufflation tube and gas heater connection.
2. The display depicts "HEATING." The tube is being pre-warmed.
3. Unplug the gas heater. The display "HEATING" disappears.
4. Remove heater tube.
5. Turn off device.

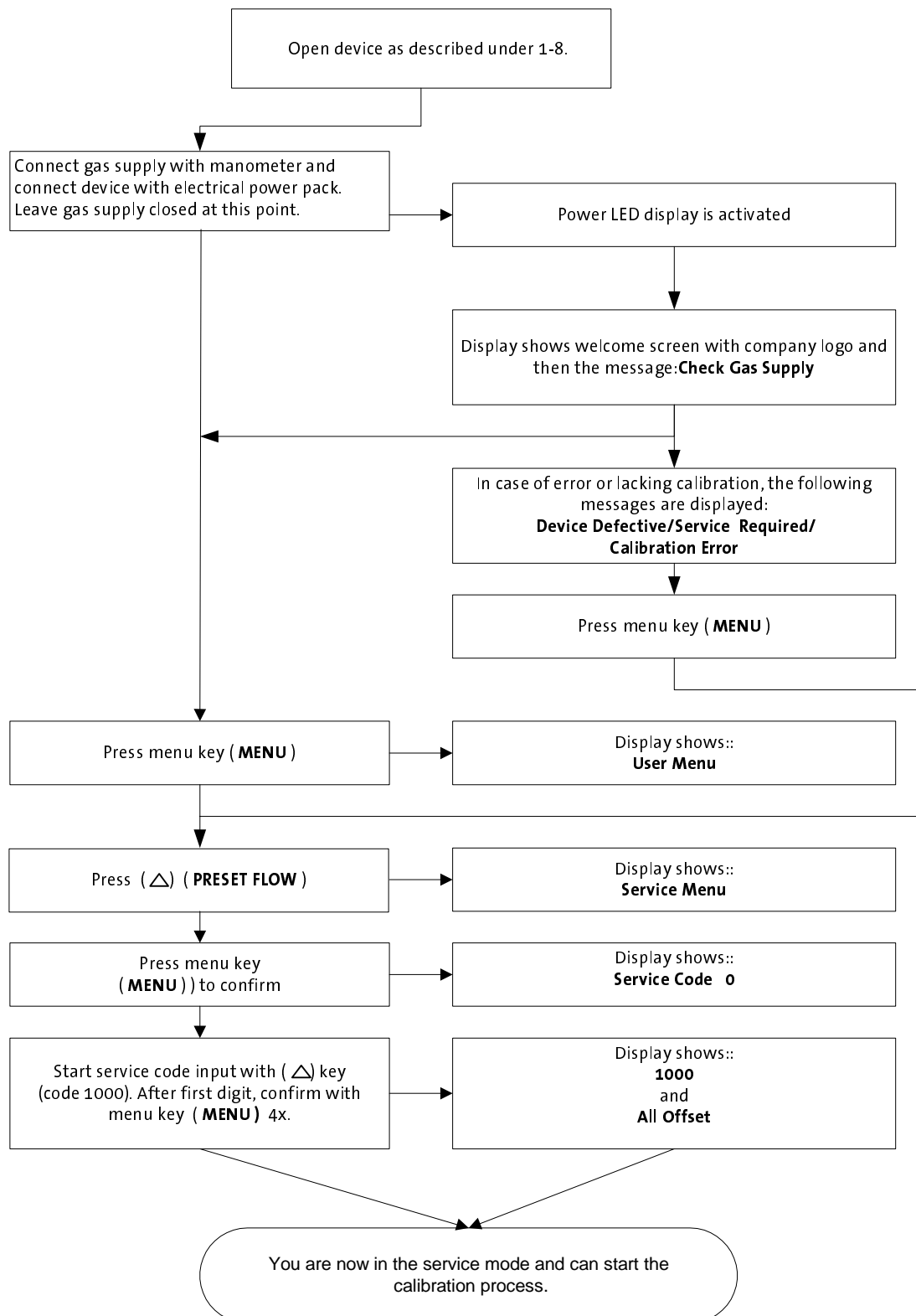
Adjustment

- Replace HPL board or cable to HPL.

3 Service Menu

3-1 Opening the Service Menu

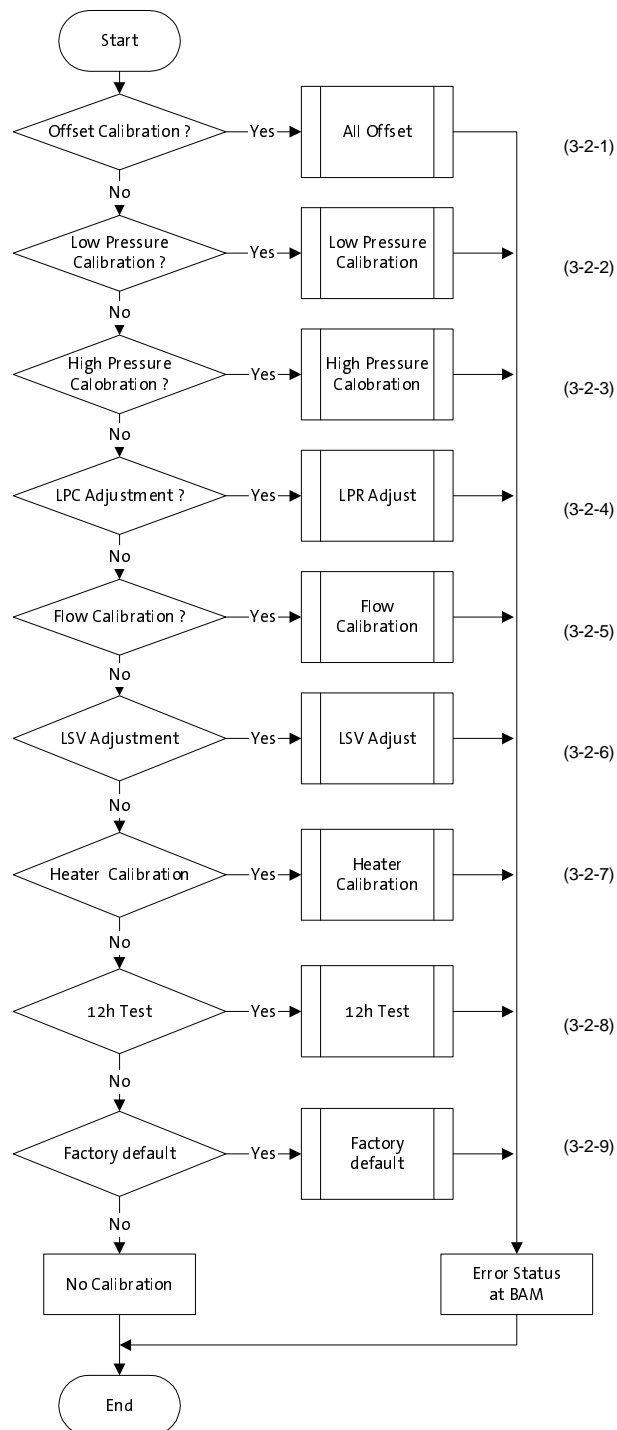
- Device parameters are displayed and changed in the service menu.
- Menu options are to be carried out in sequence to avoid malfunctions.
- Use the keys below the display for input.
- The function of each key is displayed above.
- Confirm input (Enter) with the (MENU) key.
- Use the (RESET) key to exit current menu level (Esc) and to return to the previous level.



3 Service Menu

3-2 Calibration

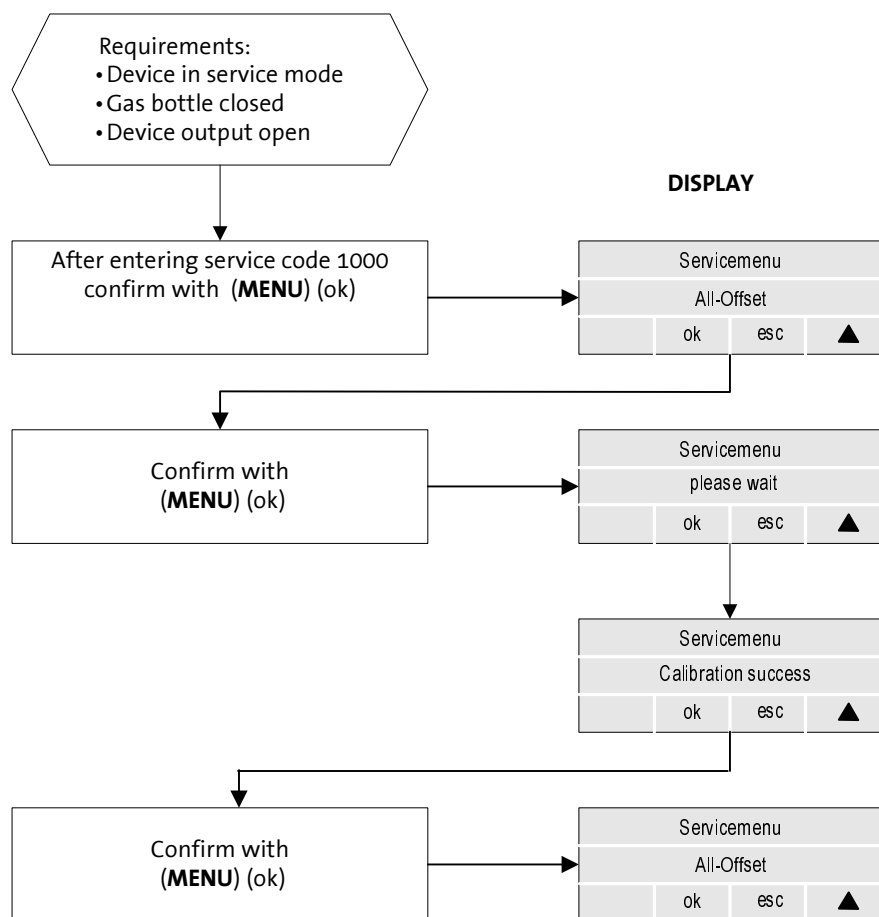
The following chart provides an overview over the necessary calibrations.



- Use the keys below the display for **input**.
- The **function** of each key is displayed above.
- **Confirm** input (Enter) with the **(MENU)** key.
- Use the **(MENU)** and **(Δ)** key to open the **next menu level**.
- Use the **(▽)** key to open the **previous menu level**.
- Use the **(RESET)** key to **exit** current menu level (Esc).

3 Service Menu

3-2-1 Offset Calibration



3 Service Menu

3-2-2 LOW Pressure Calibration

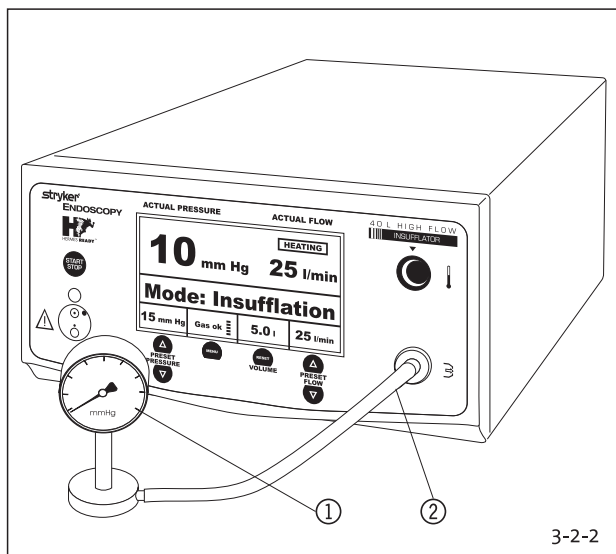
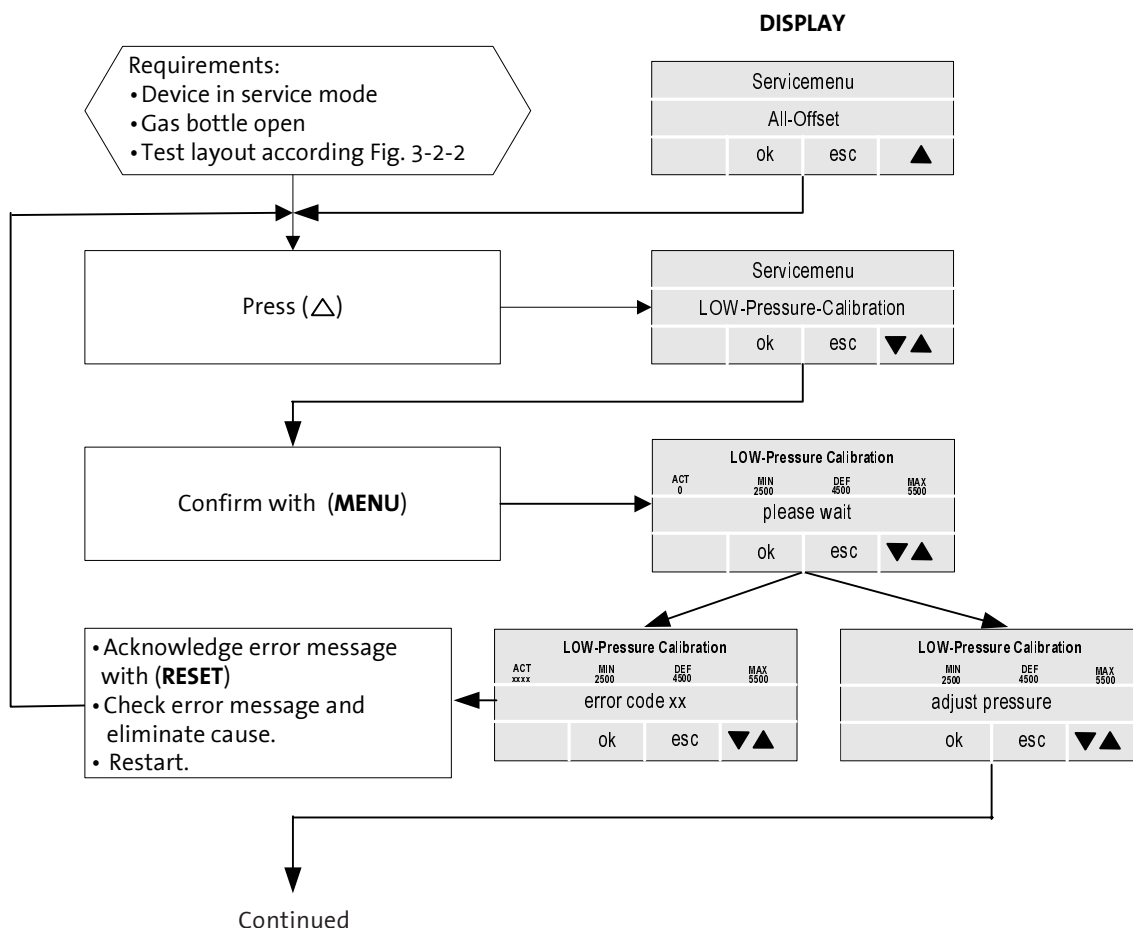


Fig. 3-2-2: Test Layout: Low Pressure Calibration

- ① Manometer (0-70 mm Hg)
- ② Device Output/Tube Connection

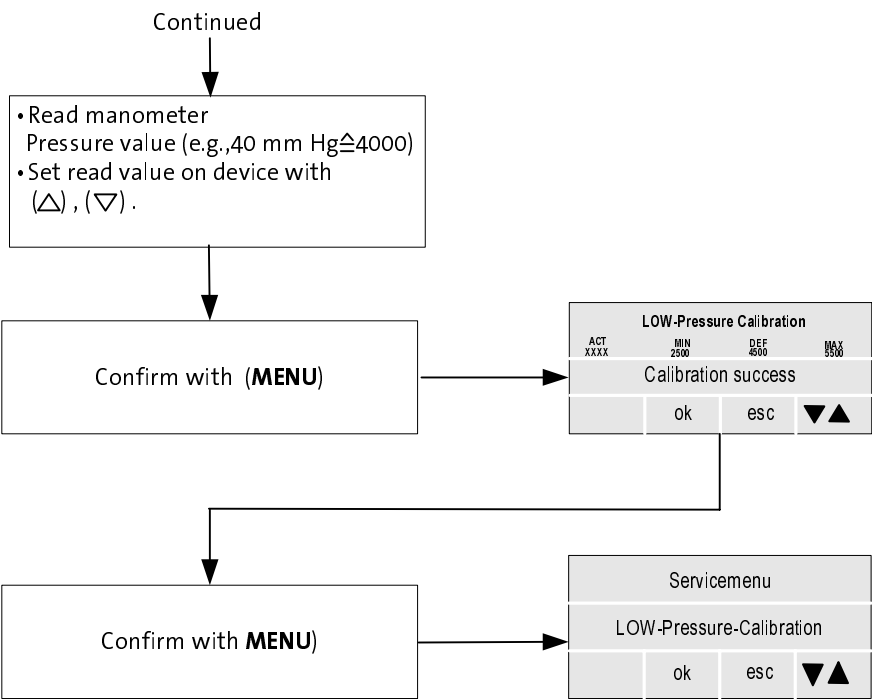


3

Service Menu

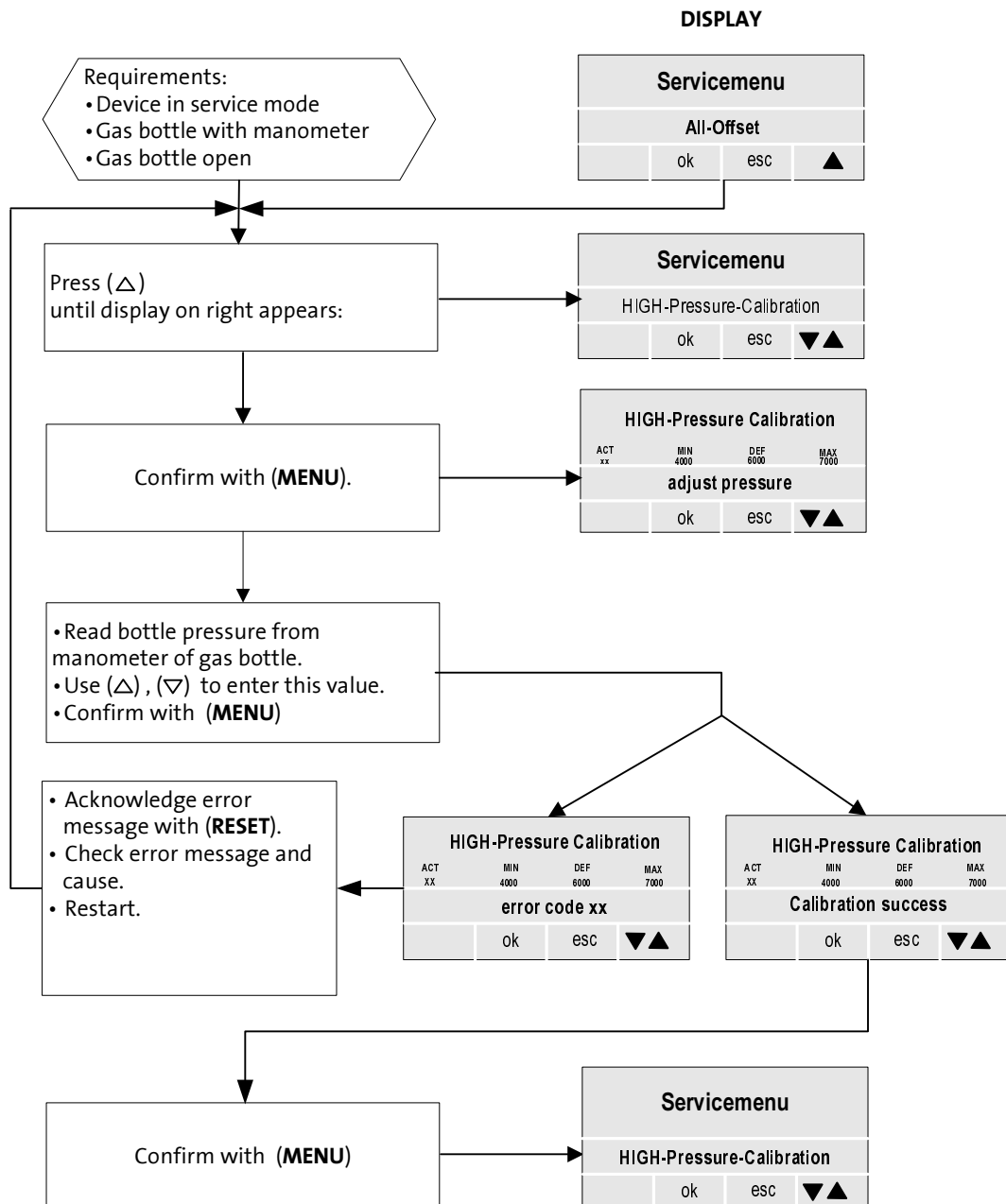
3-2-2

LOW-Pressure Calibration



3 Service Menu

3-2-3 HIGH Pressure Calibration



3 Service Menu

3-2-4 LPR Calibration

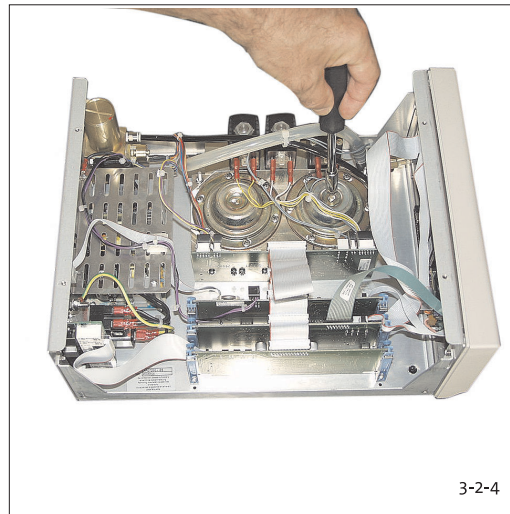
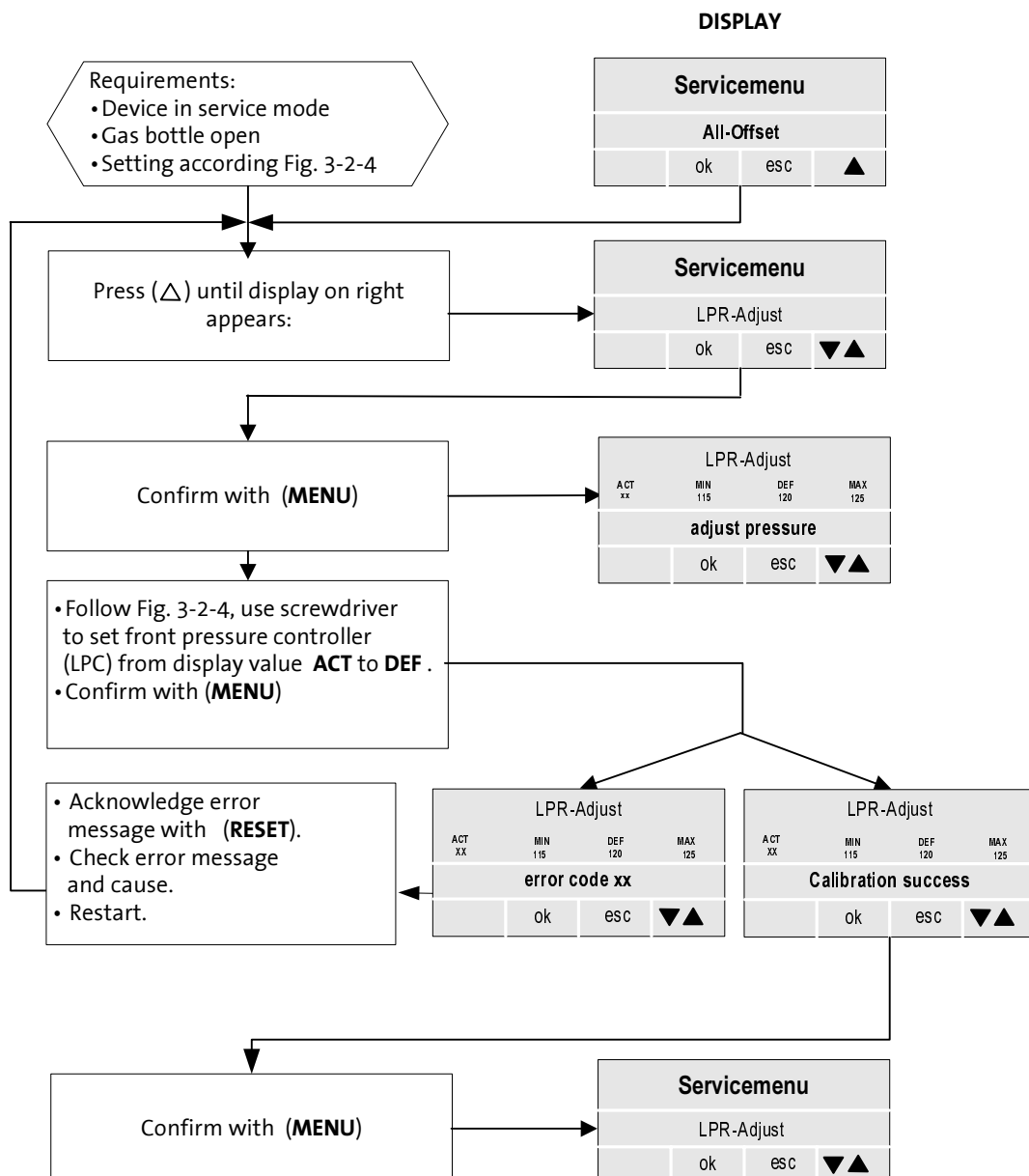


Fig. 3-2-4: F105 Low Pressure Controller Settings



3 Service Menu

3-2-5 Flow Calibration

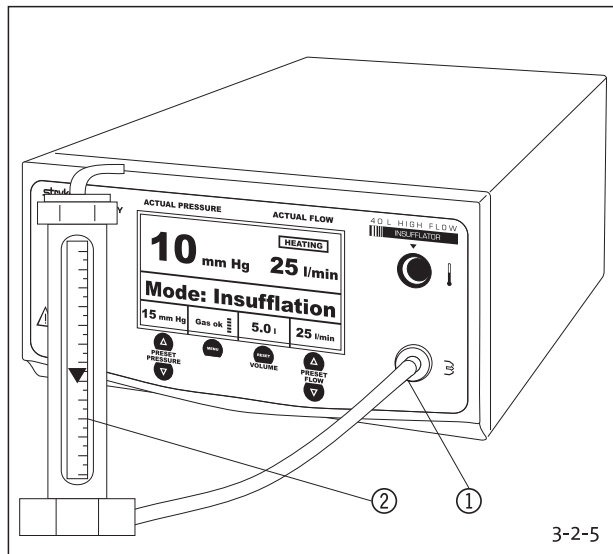
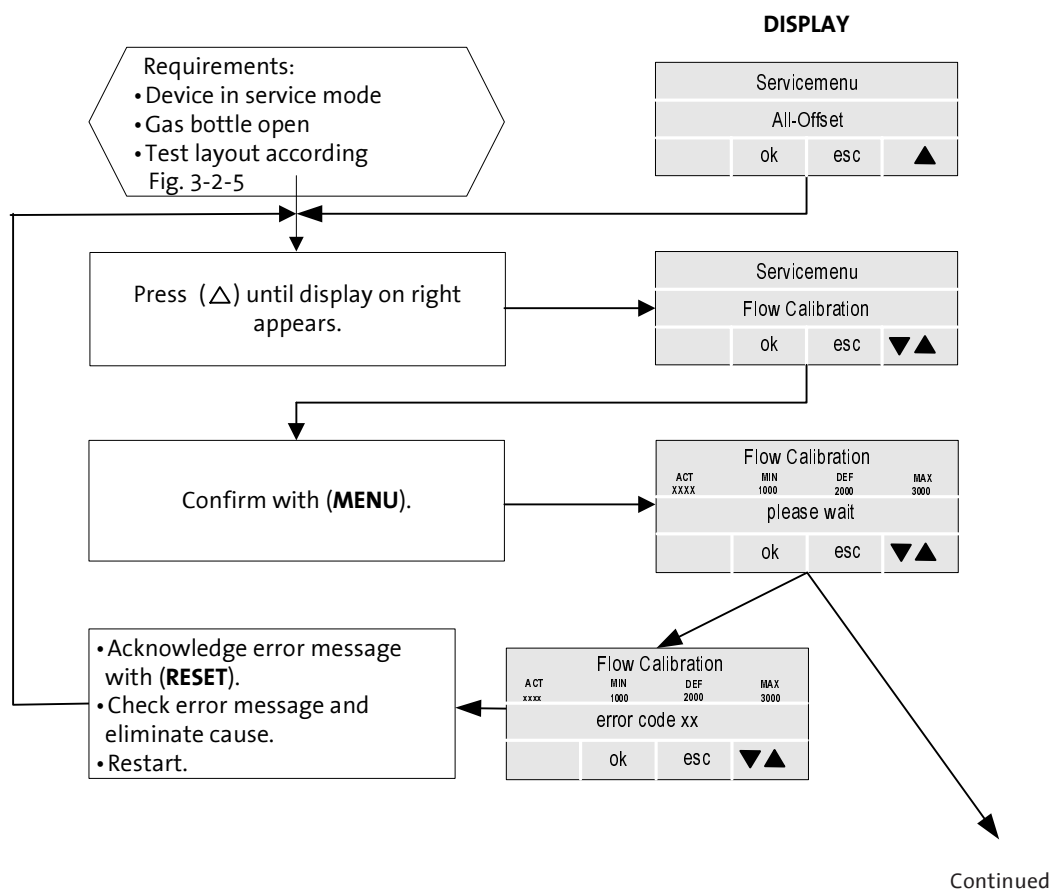


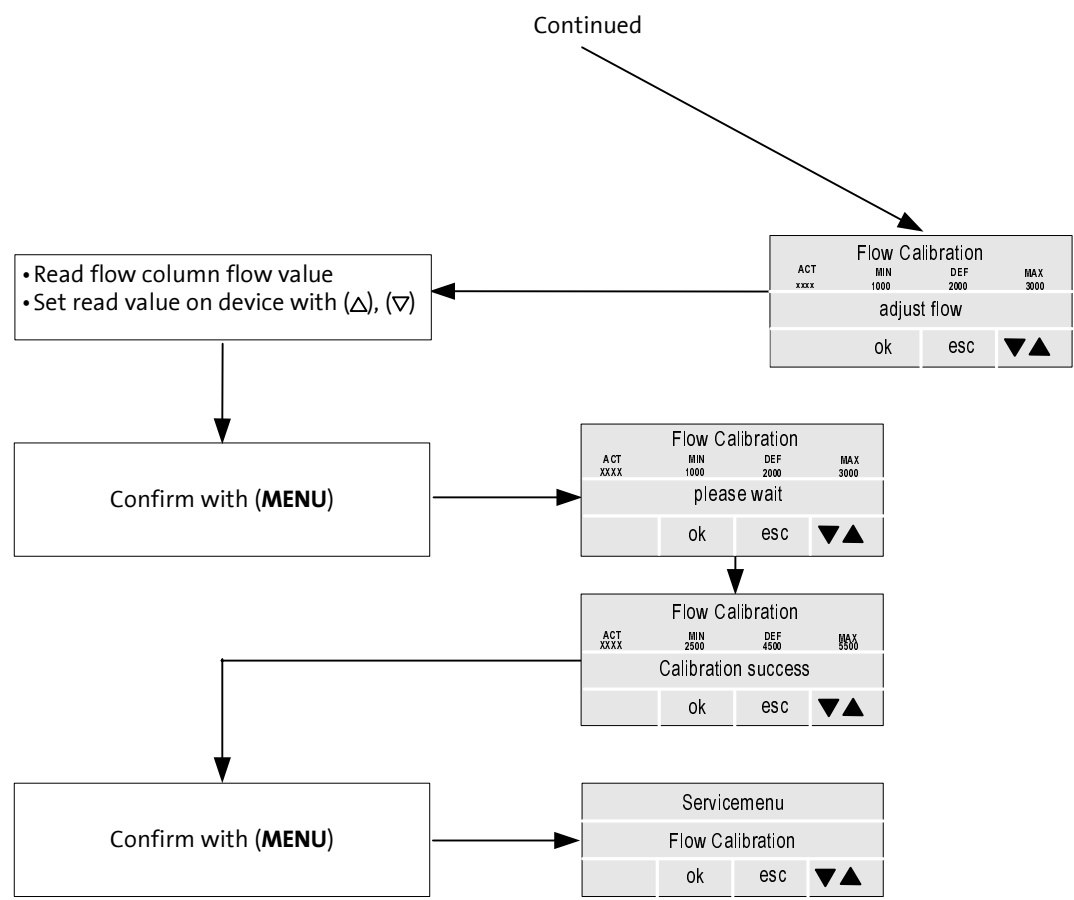
Fig. 3-2-5: Test Layout: Flow Calibration

- ① Device Output/Tube Connection
- ② Flow Column (40 l/min)



3 Service Menu

3-2-5 Flow Calibration



3 Service Menu

3-2-6 LSV-Calibration

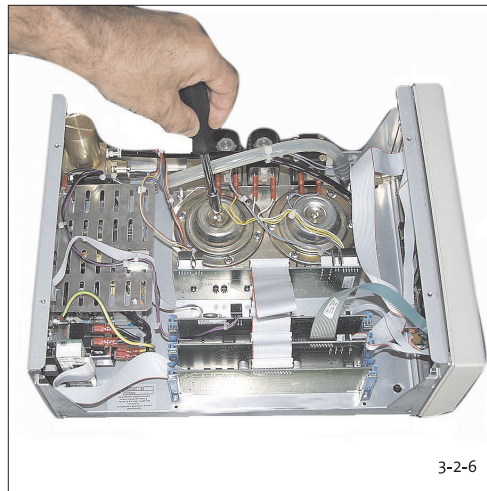
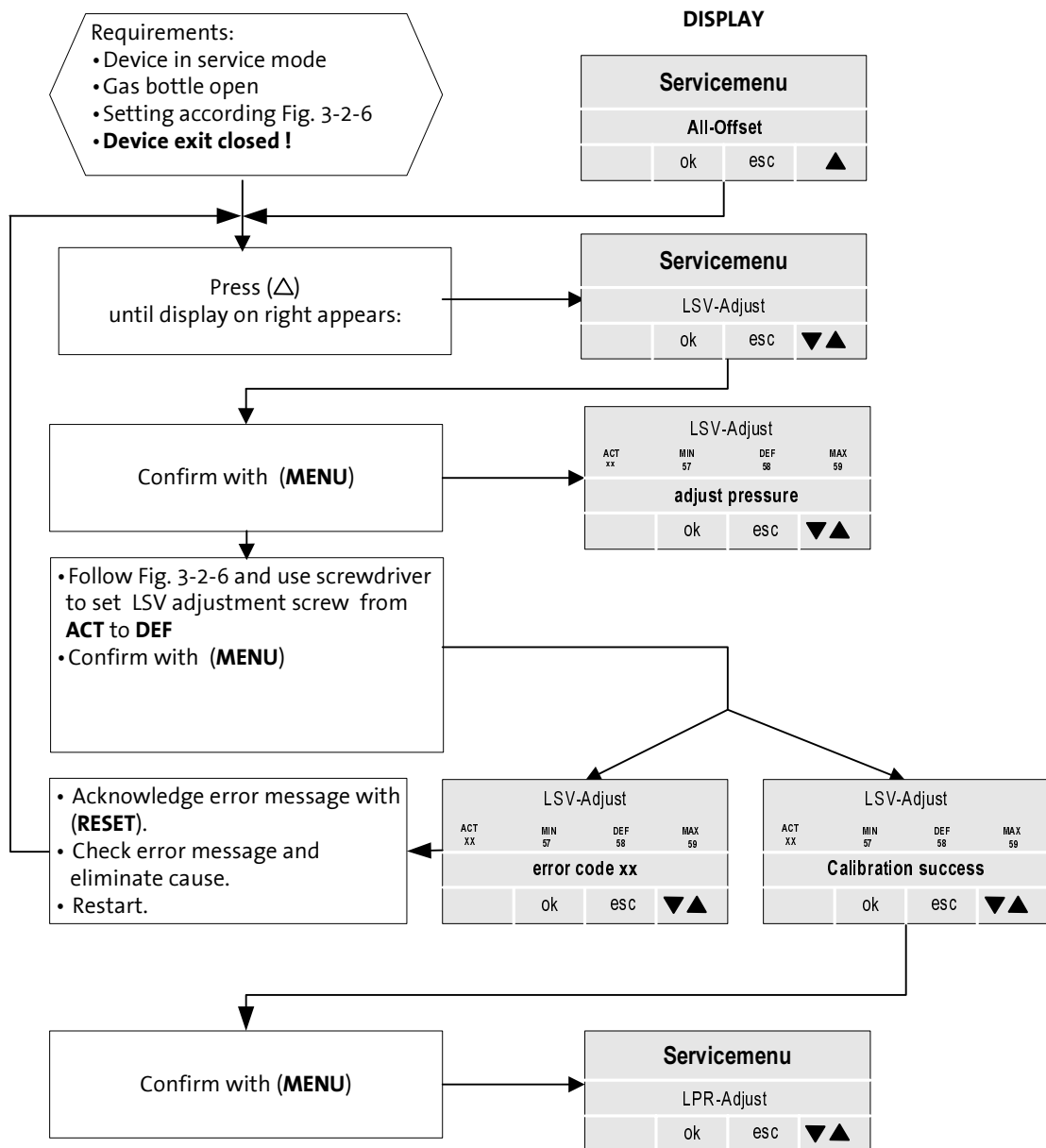


Fig. 3-2-6: LSV Setting



3 Service Menu

3-2-7 Heater Calibration

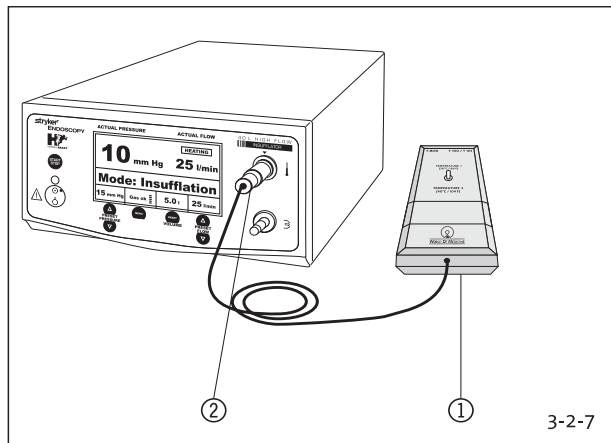


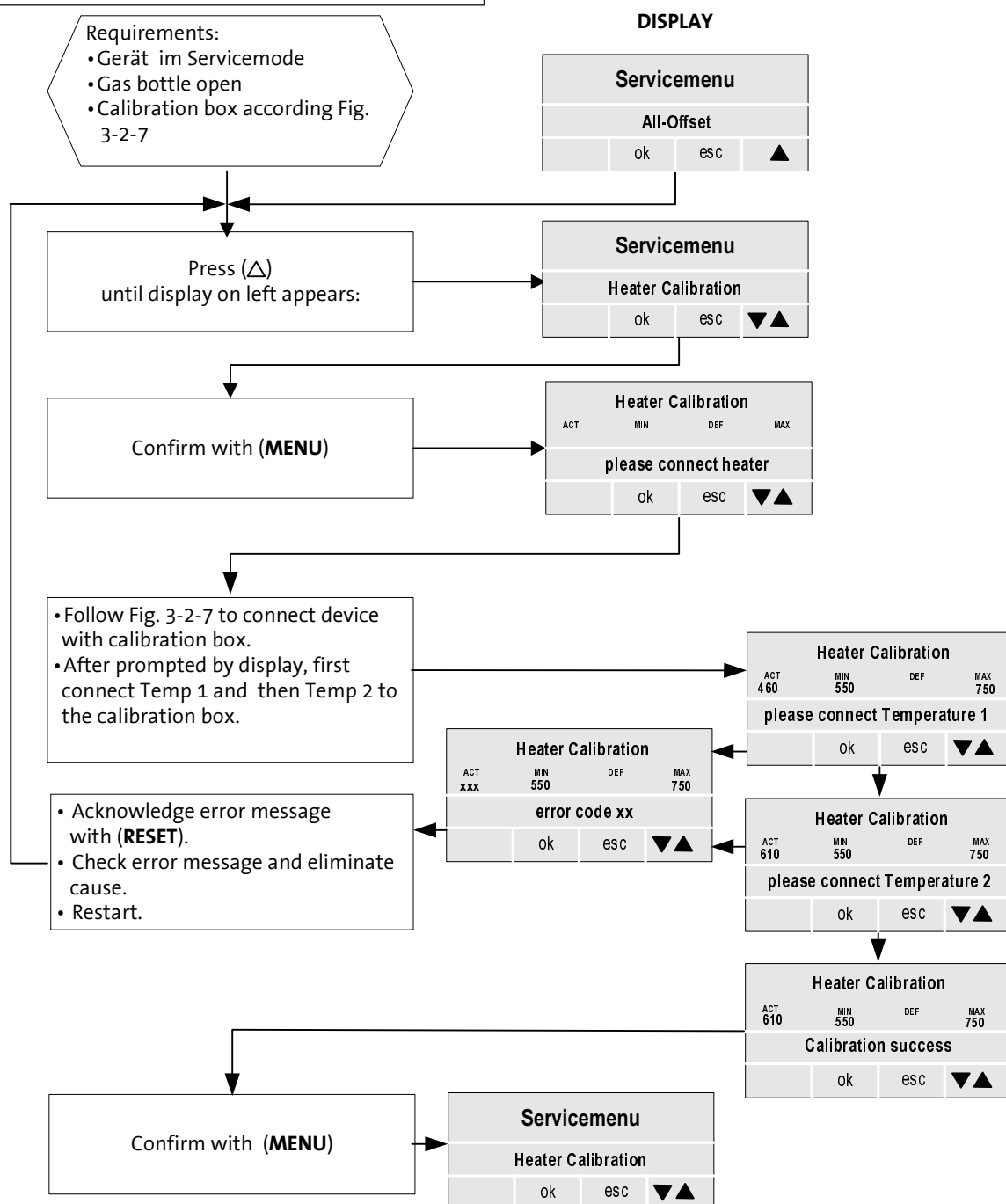
Fig. 3-2-7: Connection for Heater Calibration Box

- ① Heater Calibration Box T100/T101
- ② Connection for Heater Calibration Box

Requirements:

- Gerät im Servicemodus
- Gas bottle open
- Calibration box according Fig. 3-2-7

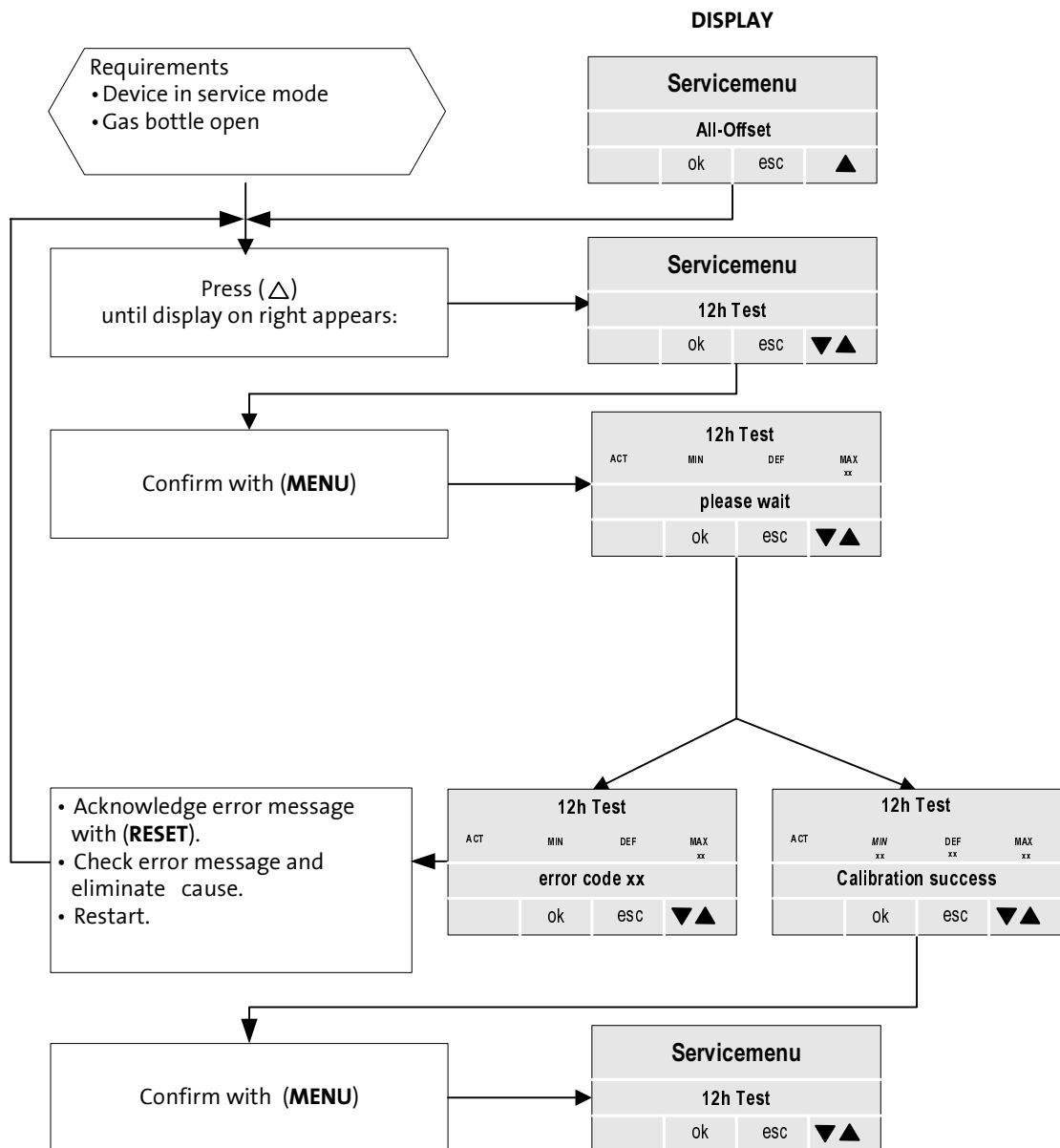
DISPLAY



3 Service Menu

3-2-8 12h Test

Make sure device is continuously connected with live wire during 12 hour test and is not operated or used in any other capacity during this test.

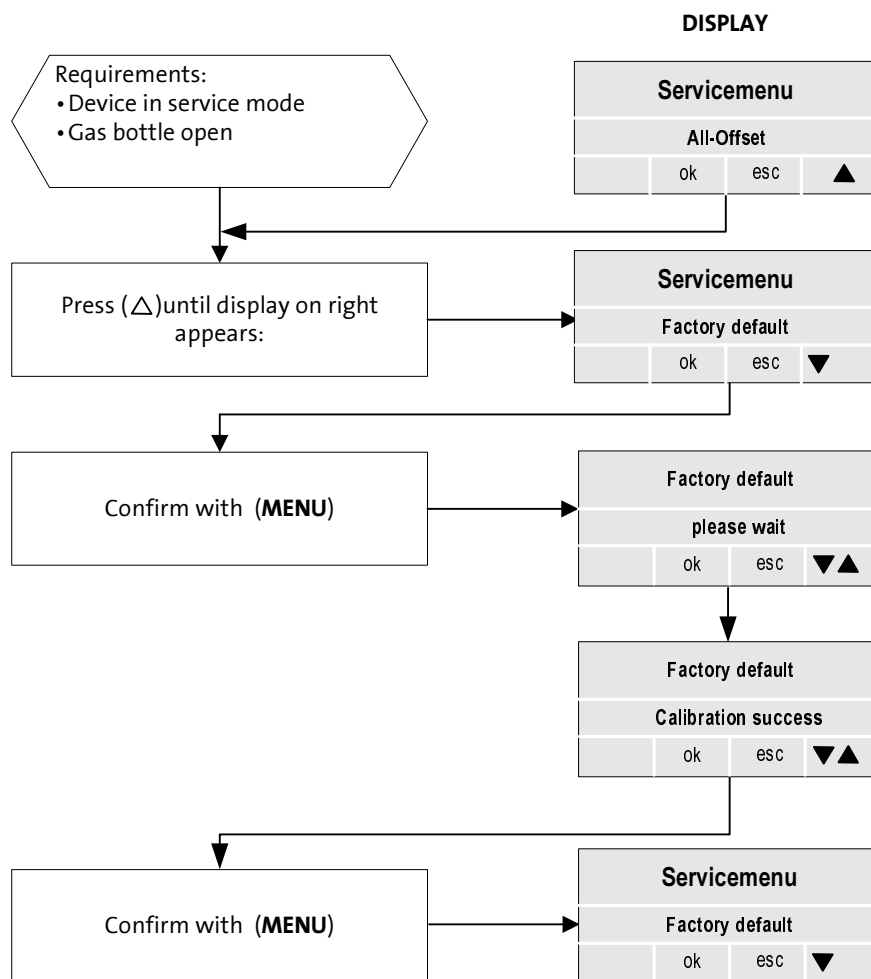


Switch device off and on again after calibration is completed to avoid error messages.

3 Service Menu

3-2-9 Factory Default

Using this menu option will reset all values to the factory default settings. The device is then not calibrated and cannot be operated.



4 Replacing Components

The following components and modules can be replaced if malfunctioning:

- Entire High Pressure Unit HPU
- Entire Power Pack
- Non-Heating Device Plug
- Basic Board Module BAM
- Video Board LCD
- Board HPL
- Entire Pneumatics Unit (Low Pressure Unit)
- Entire Set of Cables
- Insufflator Tube Set
- Entire Fluid Sensor
- Device Feet
- Entire Video Board
- Hermes Interface
- Potential Equalization Plug

The device has to be opened as described in Chapter 1-7 to replace any modules or components.

4-1 High Pressure Unit HPU

The high-pressure unit is connected with the gas port. The high-pressure unit consists of the following function elements:

- Pressure Controller
- High Pressure Fuse
- High Pressure Sensor



Fig. 4-1-1: Device Rear: Gas Connection Port

- ① High Pressure Unit Fastening Screws
- ② Gas Connection

4 Replacing Components

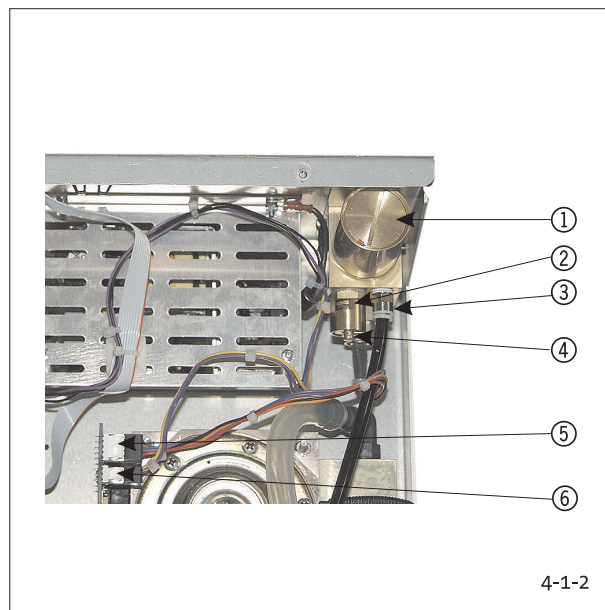


Fig. 4-1-2: High Pressure Unit Connections

- ① High Pressure Unit HPU
- ② High Pressure Fuse
- ③ Connection for Gas Tube
- ④ High Pressure Sensor
- ⑤ High Pressure Sensor Connection
- ⑥ Temperature Sensor Connection

Replace elements if malfunctioning and in case of causally determined flow limitation.

1. Open device as described in Chapter 1-7.
2. Remove gas connection (see Fig. 4-1-1) as described in Chapter 4-2.
3. Remove gas tube from HPU as well as the electric jumpers (see Fig. 4-1-2).
4. Unscrew the four fastening screws on rear plate and remove HPU.
5. Reverse instructions to install elements.

Conduct the following tests after replacing modules or components:

1. New calibration of offset and high pressure.

4 Replacing Components

4-2 Gas Connection

The gas connection consists of the following:

- Supply-specific connection adapter completely installed with:
- Screw Unions SW 24
- O-Ring on Face

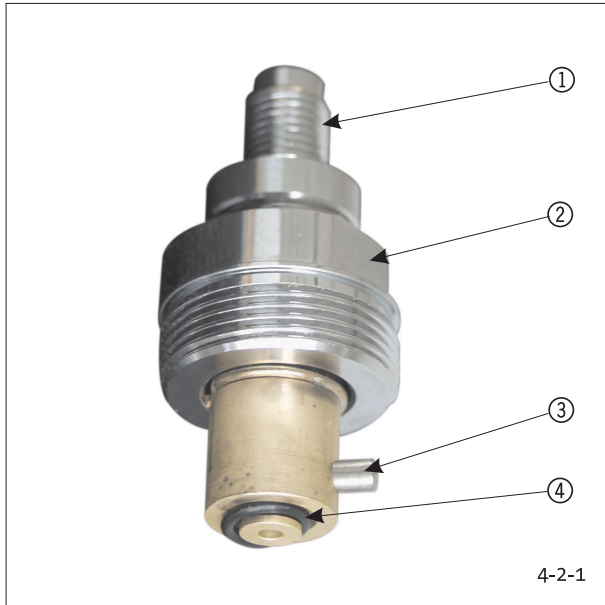


Fig. 4-2-1: CO2 Gas Connection

- ① Gas Supply Connection
- ② Flat SW 24
- ③ Anti-Twist Stop
- ④ O-Ring Seal

Replace elements in case of defective, non-sealing pressure connections, flow-reducing filter soiling, and if operational functionality is reduced.

1. Use SW 24 adjustable wrench to Unscrew rear plate screws.
2. Make sure O-ring remains in place when removing component.
3. Reverse instructions to install elements. **Make sure anti-twist stop is properly inserted when replacing gas connection!**

Conduct the following tests after replacing modules or components:

1. High pressure level test (Item 2-3).
2. Flow volume test (Chapter 2-6).

4 Replacing Components

4-3 Low Pressure Unit LPU

Replace elements if malfunctioning and in case of flow limitation.

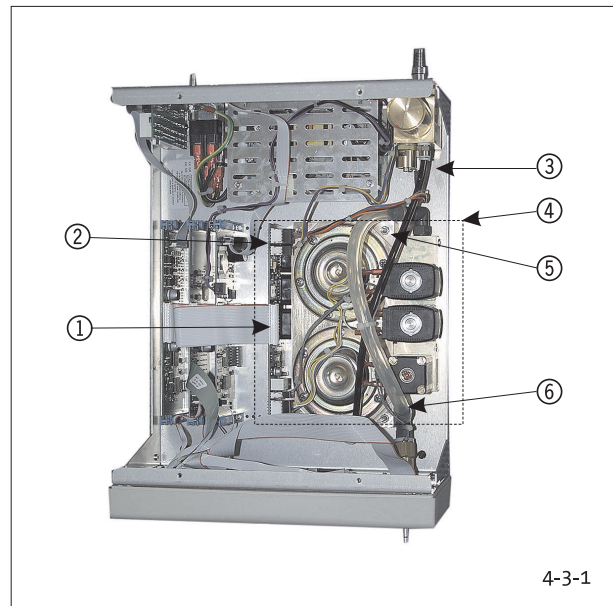


Fig. 4-3-1: Position LPU

- ① Flat Cable/Plug-in Connection
- ② Electrical Plug-in Connection with High Pressure Unit
- ③ Tube Connection with HPU
- ④ Complete LPU
- ⑤ SW 7 Nut / Tooth Lock Washer (4x)
- ⑥ Connection Tube

1. Remove the connection tube from the LPU ③ ⑥ .
2. Unscrew the plug-in connections for the electronic plugs ① ② .
3. Unscrew four fastening nuts ⑤ at base case of pneumatics unit; remove the tooth lock washers, and lift out the entire LPU complete with block, valves, and board.

Reverse instructions to install elements.

Conduct the following tests after replacing modules or components:

1. Calibration according to Chapters 3-2-1 to 3-2-6 and Chapter 3-2-8.

4 Replacing Components

4-4 Power Pack

Replace power pack if malfunctioning and in case of repeated safety defect.

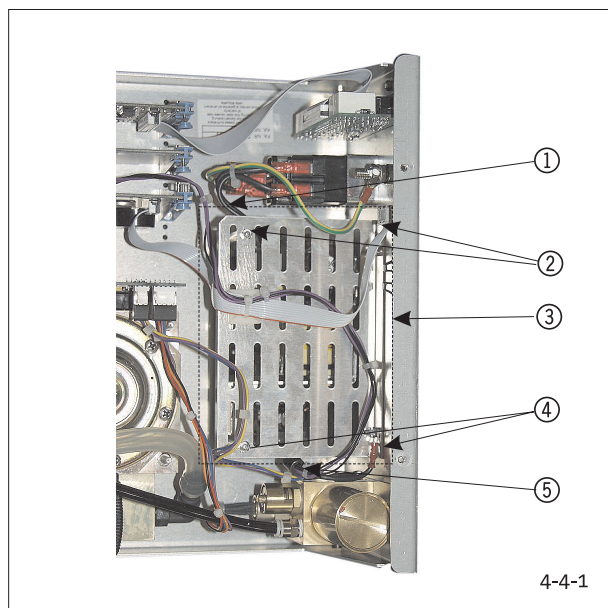


Fig. 4-4-1: Position Power Pack

- ① Voltage Input Cable/Plug-in Connection
 - ② Fastening Nuts/Tooth Lock Washers for Cover
 - ③ Entire Power Pack
 - ④ Fastening Nuts/Tooth Lock Washers for Cover
 - ⑤ Voltage Output Cable/Plug-in Connection
1. Remove the electrical plug-in connectors ① ⑤ .
 2. Use SW 5.5 adjustable wrench to Unscrew four fastening nuts ② ④ on cover and remove cover.
 3. Unscrew two bolt screws on front of power pack board and two nuts in rear and lift power pack from case.

Reverse instructions to install elements.

Conduct the following tests after replacing modules or components:

1. Use a multimeter to check voltage at input and output of power pack.
2. Switch on device and perform function check.
3. Safety test according to Chapter 2-1.

4 Replacing Components

4-5 Non-Heating Device Plug

Replace non-heating device plug if malfunctioning and in case of defects.

The non-heating plug is available as a complete kit including screws, cables with plugs, and fuse holder with fuse.

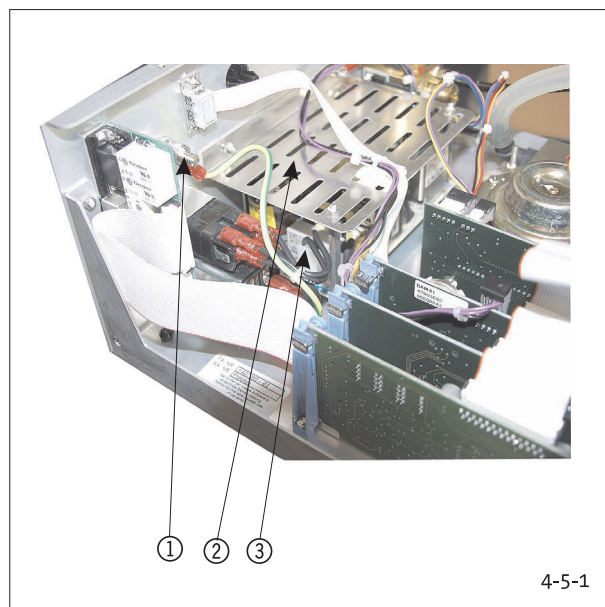


Fig. 4-5-1: Position Non-Heating Device Plug

- ① Bolt Screw for Mass Connection/Potential Equalization Line
 - ② Power Pack
 - ③ Power Pack Connector Plug
1. (Fig. 4-5-1) Unscrew PE connection ① .
 2. Remove plug-in connector at cable of non-heating device plug of power pack ② by pulling towards top.
 3. (Fig. 4-5-2) Unscrew two fastening screws ① at rear plate and remove non-heating device plug by pulling towards rear.
 4. Reverse instructions to install elements.



Fig. 4-5-2: Non-Heating Device Mounting Screws

① Non-Heating Device Mounting Screws

Conduct the following test after replacing modules or components:

1. Switch on device and perform function check.
3. Safety test according to Chapter 2-1.

4-6 Panel Board (ON/OFF Key)

Replace panel board or remote control if malfunctioning ON/OFF key.

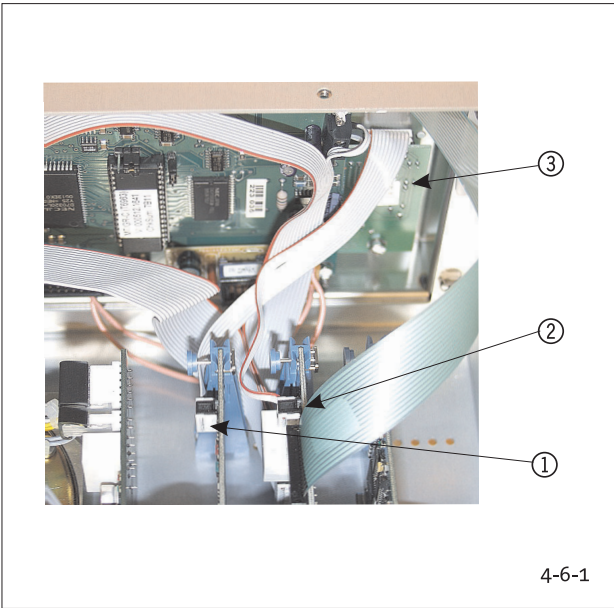


Fig. 4-6-1: Position Panel Board (ON/OFF Key)

① Plug-in Connector to Basic Module BAM 01

② Plug-in Connector to I/O Module IOM 01

③ Panel Board

1. Remove the electrical plug-in connectors ① ② ..
2. Unscrew two nuts and washers ③ .
3. Remove board.

Reverse instructions to install elements.

Conduct the following tests after replacing modules or components:

1. Remote control test, installation check, function test, display.
2. Safety test, Chapter 2-1.

4 Replacing Components

4-7 Modules/Boards

Replace the respective board in case of malfunction or defect.

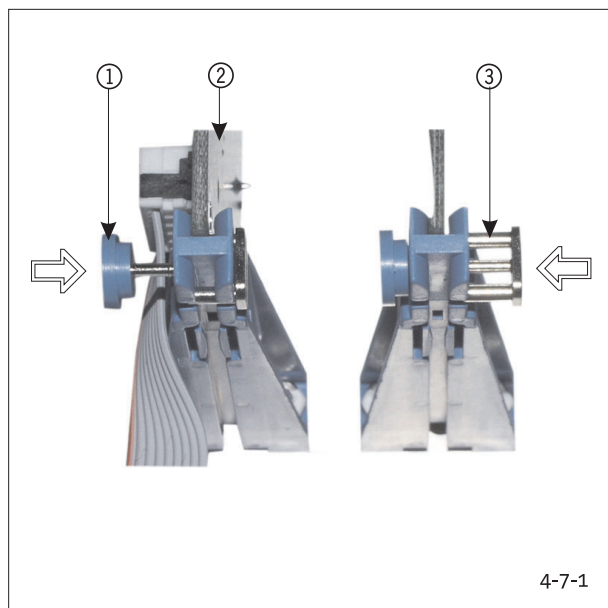


Fig. 4-7-1: Component Boards-/Module Release

- ① Locked position-> Press to release
- ② Component Board/Module
- ③ Released position-> Press to lock

1. Remove the electrical plug-in connectors from the component boards/modules.
 2. Firmly grasp component board/module and press button ① to release.
 3. Reverse instructions to install elements.
 4. Lock component board/module -> Position ①.
- Conduct the following test after replacing modules or components:
- Function test of replaced components.

4 Replacing Components

4-8 Video Board/LCD

Replace video board if malfunctioning and in case of defects.

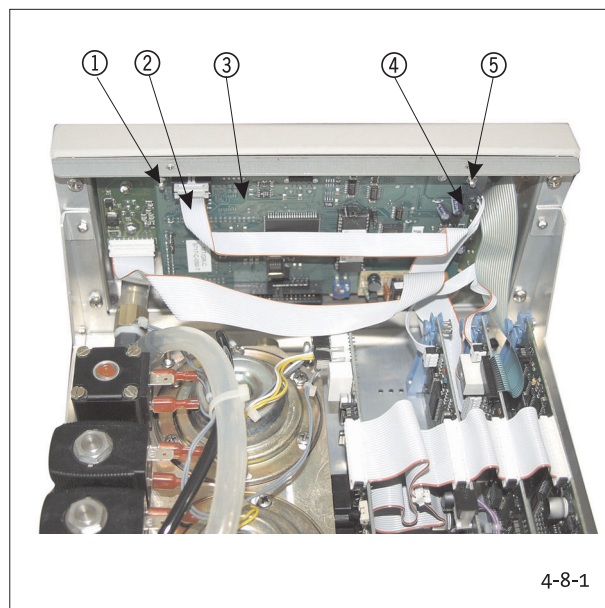


Fig. 4-8-1: Position Video Board/LCD

- ① Fastening Nut/Tooth Lock Washer
- ② Plug-in Connector from I/O Module
- ③ Video Module DIU
- ④ Terminal Screw for Cable from I/O Board
- ⑤ Fastening Nut/Tooth Lock Washer

The video board and the LCD can be removed without first having to disassemble other components. However, access to the video board is much easier if the front panel has been removed (see Chapter 4-12).

A SW 5.5 fork wrench/ring wrench and a small screwdriver are required for the removal of the video board.

Be careful not to damage any cables or other components when removing the video board.

1. Remove the cable connectors ② ④.
2. (4x) Unscrew the fastening nuts ① ⑤ and tooth lock washers at the corners of the video board ③.
3. Watch out for the distance sleeves between video board and LCD when removing the video board together with the LCD from the bolt screws.

Reverse instructions to install elements.

Conduct the following test after replacing modules or components:

1. Function test of LCD display.

4 Replacing Components

4-9 Heater Board HB

Replace heater board if malfunctioning or in case of gas heater tube defects.

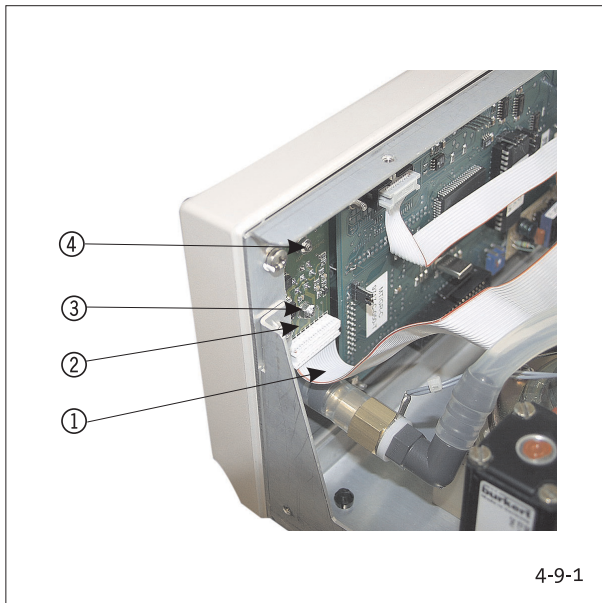


Fig. 4-9-1: Position Heater Board

- ① Connecting Cable to I/O Module IOM
- ② Heater Board HB
- ③ Nut/Tooth Lock Washer for Fastening
- ④ Nut/Tooth Lock Washer for Fastening

The heater board can be removed without first having to disassemble other components.

1. Unscrew fastening nuts and tooth lock washers ③ ④.
2. Remove board ② together with the connecting cable ① from bolt screws by pulling towards rear.
3. Remove cable connector from heater board.

Reverse instructions to install elements.

Conduct the following test after replacing modules or components:

1. Heater function test (Chapter 2-9).

4 Replacing Components

4-10 Insufflation Tube Connection (Gas Outlet)

Replace if surface shows defects that allow leaks.

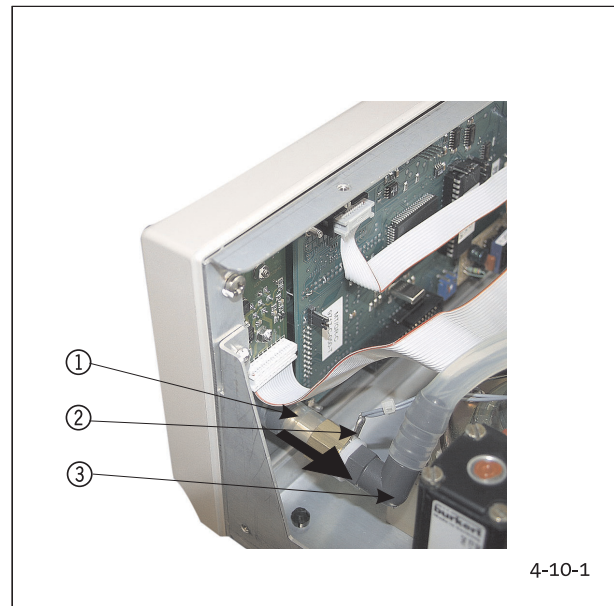


Fig. 4-10-1: Position Insufflation Tube Connection

- ① Fluid Sensor (FLS)
- ② Fluid Sensor Electrical Connection
- ③ L-Shaped Adapter from Fluid Sensor

1. Remove connecting cables and front panel (see Fig. 4-12).
2. Carefully remove the FLS ① together with the L-shaped adapter ③.
3. Use a SW 19 adjustable wrench to unscrew inner lock nut from gas outlet.
4. Remove locknut and lock washer.
5. Pull gas outlet towards front and remove.

Reverse instructions to install elements.

Conduct the following tests after replacing modules or components:

1. Leak test according to Chapter 2-5.
2. Safety test, Chapter 2-1.

4-11 Fluid Sensor

Replace if malfunctioning.

The electrical connector of the fluid sensor

(Fig. 4-10-1, ②) is integrated into the connecting adapter between insufflation tube connection and pneumatic unit.

If necessary, replace the entire connecting adapter.

1. Remove cable from the cable connector.
2. Detach tube connection as described in Chapter 4-10.

Reverse instructions to install elements.

Conduct the following tests after replacing modules or components:

1. Leak test according to Chapter 2-5.
2. Safety test according to Chapter 2-1.

4 Replacing Components

4-12 Front Panel

Replace front panel or operating key if either are damaged or a front panel malfunction occurs.

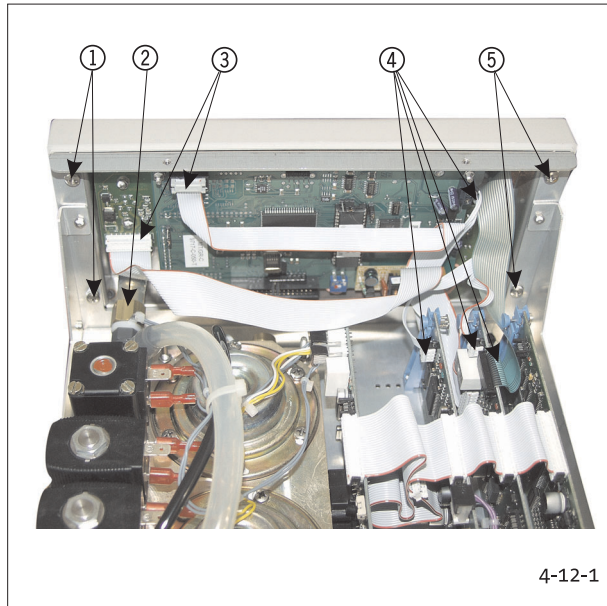


Fig. 4-12-1: Fastening Front Panel

- ① Mounting Screws
- ② Insufflation Tube Connection
- ③ Plug-in Connection
- ④ Plug-in Connection
- ⑤ Mounting Screws

1. Remove the electrical plug-in connectors ③ ④ .
 2. Unscrew 2 cross-recessed screws ① ⑤ on the left and right.
 3. Remove tube connection to the insufflation tube connector.
 4. Carefully remove front panel by pulling towards front.
 5. Detach elements attached to the inside of the front panel.
- Reverse instructions to install elements.

Conduct the following tests after replacing modules or components:

1. Function test of replaced components.
2. Safety test according to Chapter 2-1.

5 Spare Parts List

Artikelnummer	Description
200-3432-X	Compl. High Pressure Unit
200-1057-X	Compl. Power Pack
41-00096-1X	Non-Heating Device Plug
200-1055-X	Basic Board Module
200-1054-X	Input/Output Board Module
200-0811-X	LCD Board / Display
200-3400-X	Panel Board
200-3399-X	Gas Heater Board
200-3401-X	Compl. Pneumatics Unit (Low Pressure Unit)
200-3393-X	Compl. Set of Insufflator Cables
46-10027-1X	Insufflator Tube Set
200-4443-X	Tube Connection F105 6/8
200-3392-X	Case Cover
200-3397-X	Front Panel
200-3406-X	Compl. Fluid Sensor
16-00002-1X	Device Castors
200-3409-X	Compl. Video Board
200-3440-X	Hermes Interface
46-00054-1X	Potential Equalization Plug

6 Calibration Error Messages

*To troubleshoot check connections and settings first and then repeat the calibration process before replacing a component or component group.

Error	Message	Cause	Troubleshooting
0		General error	Replace LPU
1		Timeout	Replace LPU
2		General software error	Replace LPU
3		EEPROM write error	Replace LPU
4		General gas supply error	Check gas supply
10		General offset calibration error	Replace LPU
11		Offset Low pressure regulator too low	Replace LPU
12		Offset Low pressure sensor too low	Replace LPU
13		Offset Safety pressure sensor too low	Replace LPU
14		Offset Differential pressure sensor too low	Replace LPU
15		Offset High pressure sensor too low	Replace LPU
16		Offset Temperature sensor too low	Replace LPU
17		Offset Current monitoring of high pressure gas heater too low	Replace LPU
18		Offset Gas heater too low	Replace LPU
19		Offset Low pressure regulator too high	Replace LPU
20		Offset Low pressure sensor too high	Replace LPU
21		Offset Safety pressure sensor too high	Replace LPU
22		Offset Differential pressure sensor too high	Replace LPU
23		Offset High pressure sensor too high	Replace LPU
24		Offset Temperature sensor too high	Replace LPU
25		Offset Current monitoring of high pressure gas heater too high	Replace LPU
26		Offset Gas heater too high	Replace LPU
50		General low pressure calibration error	Check FIS
51		Low pressure - large leak	Check manometer connection
52		Low pressure - small leak	Check manometer connection
53		Low pressure intake value too low	Check gas supply, HPU
54		Low pressure intake value too high	Check gas supply, calibrate LPR
55		Amplification I - Low pressure	Replace LPU
56		Amplification I - Low pressure sensor too high	Replace LPU
57		Amplification II - Low pressure sensor too low	Replace LPU
58		Amplification II - Low pressure sensor too high	Replace LPU
59		Amplification - Safety pressure sensor too low	Replace LPU
60		Low pressure amplification - Safety pressure sensor too high	Replace LPU

6 Calibration Error Messages

* To troubleshoot check connections and settings first and then repeat the calibration process before replacing a component or component group.

Error and Warning Messages	Cause	Troubleshooting
70	General High Pressure Calibration Error	Replace HPU
73	High pressure intake value too low	Check gas supply
74	High pressure intake value too high	Check gas supply
75	High pressure sensor value has changed	Check gas supply
76	High pressure sensor amplification too low	Replace HPU
77	High pressure sensor amplification too high	Replace HPU
90	General low pressure regulator calibration error	Replace LPU
91	Adjustment - Low pressure regulator not in range	Repeat calibration
110	Low pressure safety calibration error	Check flow meter, replace LPU
111	Adjustment - Low pressure safety not in range	Repeat calibration
130	Flow	Check flow meter, replace LPU
131	Flow resistance too high	Check flow meter, replace LPU
132		
133	Flow intake value too low	Replace LPU
134	Flow intake value too high	Replace LPU
135	Flow sensor value changed	Replace LPU
136	Amplification - Flow sensor too low	Replace LPU
137	Amplification - Flow sensor too high	Replace LPU
138	Offset Proportional valve too low	Replace LPU
139	Offset Proportional valve too high	Replace LPU
140	Hysteresis - Proportional valve too low	Replace LPU
141	Hysteresis - Proportional valve too high	Replace LPU
142	Amplification - Proportional valve too low	Replace LPU
143	Amplification - Proportional valve too high	Replace LPU
144	Sticky proportional valve	Replace LPU

7 Technical Data

Power Supply	100 -240 V~ Main Fuse T 3,15 A USA 3,15 A (slow blow), UL-recognized 220-240 V~ Main Fuse T 3,15 A, UL-recognized Connection for potential equalization
Frequency	50-60 Hz
Max. Power Consumption	130 /150*W
Max. Current	100 V: 1250/1400 *mA 240 V: 540/620* mA
Protection Class	I, Typ BF, IP41
Dimensions	Width x Height x Depth 273 x 145 x 360 [mm] 10,75x5,7x14,2 [inch]
Weight	Approx. 7 kg
Operation Conditions	10-40 °C / 50-104 °F 30-75 % rel. air humidity
Storage and Transportation Directions	-40 - +70 °C / 40 - +158°F 10-85 % rel. air humidity 85-100% rel. air humidity (14 days)
Manufactured and Tested acc. to	EN 60601-1 / IEC 601-1
EMV	EN 60601-1-2 / IEC 601-1-2
CE	93/42/ EWG
Insufflation medium	Medical CO ₂
Maximun output pressure	55 mm Hg
Maximun gas supply pressure	80 bar/1160 PSI
Minimum gas supply pressure	5 bar/73,3 PSI
Measurement range of gas supply	0-50 bar/0-725 PSI
Maximun gas flow	refer to device data plate located on rear of the device
Pressure range	1-30 mm Hg
Accuracy of pressure measurement	±5 %
Accuracy of gas flow measurement	±5 %
Accuracy of volume measurement	±10 %
Accuracy of gas supply measurement	±10 %
Conections (optional)	Video S-VHS IN/OUT Video FBAS IN/OUT Video RGB IN/OUT RS232 Service Interface

* with reusable haeting tube

8 Glossary

Term	Explanation
ADC	Analog/Digital Converter
BAM	Basic Module
DIU	Display Unit
DPS	Differential Pressure Sensor
EPx	Electrical Connection
FLS	Fluid Sensor
HIF	Hermes Interface
HPH	High Pressure Heater
HTS	High Pressure Temperature Sensor
HB	Heater Board
HPR	High Pressure Regulator
HPS	High Pressure Sensor
HPT	High Pressure Tube
HPU	High Pressure Unit
HPS	High Pressure Sensor
IFM	Interface Module
IOM	Input/Output Module
KEY	Plastic foil keyboard
LPT	Low Pressure Tube
LPR	Low Pressure Regulator
LPU	Low Pressure Unit
LSV	Low Pressure Safety Valve
MSA	Measuring Signal Amplifier
MPT	Median Pressure Tube
MSV	Median Pressure Safety Valve
OLV	Output Line Valve
PBU	Pneumatic Base Unit
PCU	Pneumatic Control Unit
PMS	Pressure Measuring Sensor
PRM	Pressure Regulator Module
PNB	Pneumatic Block
PRV	Proportional Valve
PSM	Power Supply Module
RCB	Remote Control Board
SPS	Safety Pressure Sensor
SRV	Service interface
NTS	Nominal Temperatur Sensor
VAC	Valve Controls
VEV	Vent Exit Valve
VIM	Video Module

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10 Maintenance- and Checklist

Type of device:: _____ Device no.: _____

Location of use:: _____

Maintenance date: _____ Inspected by: _____ Company: _____

I. Safety Test (chap. 2-1)

Main fuse	<input type="checkbox"/>	Incriptions	<input type="checkbox"/>	Mechanical Condition	<input type="checkbox"/>	Cleanliness	<input type="checkbox"/>
Plug connections	<input type="checkbox"/>	PC Boards	<input type="checkbox"/>	Front panel and casing	<input type="checkbox"/>		

II. Function Test (chap. 2)

High Pressure Unit HPU	<input type="checkbox"/>	Low Pressure Regulator LPR	<input type="checkbox"/>
Niederdruckeinheit LPU	<input type="checkbox"/>	Flow Volume	<input type="checkbox"/>
Warning overpressure	<input type="checkbox"/>	Blockage Alarm	<input type="checkbox"/>
		Gas Heater	<input type="checkbox"/>

III. Remarks

Date _____ Signature _____

[illegible]

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